



# CITY OF BALTIMORE



Mayor  
Brandon M. Scott

## WATER AND WASTEWATER PLAN

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**DRAFT**



Jason W. Mitchell  
Director



# **WATER AND WASTEWATER PLAN**

## **CITY OF BALTIMORE, MARYLAND**

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## CHAPTER 1 – OBJECTIVES AND ORGANIZATION

### 1.1 GENERAL:

The Water and Sewerage Plan (CITY PLAN) addresses the relationship between planned growth and planning area's water resources – including both drinking water supply and wastewater that is generated by consumption habits - to ensure that water resources will be adequate to support smart growth while meeting local economic, environmental and land use goals.

The purpose and objectives of the Plan:

1. Successful Growth Management
  - Ensure an ample supply of water may be collected, treated and delivered to points of use.
  - Achieve sustainable development by ensuring the safety and adequacy of all drinking water supplies and sewerage disposal systems for the existing and future population.
  - Focus and direct growth and new land development (or redevelopment) within Priority Funding Areas and water and sewer planning areas.
  - Prioritize infrastructure improvements via the Capital Improvement Program (CIP) to endorse sustainable development. Incorporated as part of this CITY PLAN, as Exhibit A in Appendix A, is Baltimore City's 6-Year Capital Improvement Program (CIP) for the water and wastewater programs for Fiscal Years 2022 through 2027. Subsequent annual CIP updates shall be incorporated and referenced into the CITY PLAN, as approved by the Mayor and City Council. An accompanying map of Baltimore City's CIP projects is located in Appendix A as Exhibit B.
2. Improvement of the Environment
  - Protect health of the natural environment including water resources.
3. Protection of the Water Resources
  - Identify current and future wastewater treatment demand, locations and loads required to prevent or minimize adverse environmental effects on legitimate water uses.

Environment Article, Title 9, Subtitle 5, of the Annotated Code of Maryland requires the development of water supply and wastewater systems in accordance with the CITY PLAN that is consistent with the population growth and economic development to provide water and wastewater services to the City of Baltimore (City) and the Baltimore Metropolitan region residents and businesses, and to protect the environment. It further specifies that the extension and expansion of such water supply and wastewater systems will be in compliance with state laws relative to air pollution, water pollution, environmental protection, and land uses; and will be consistent with the Baltimore City's Comprehensive Master Plan. The State of Maryland, Department of the Environment (MDE) Regulation 26.03.01 establishes procedures for implementing laws and regulations. The Water and Sewerage Plan is indeed consistent with and supportive of the City's goals of comprehensive planning. The City of Baltimore will continue the following actions to protect public water supplies and sewer systems:

- Work with adjacent jurisdictions to protect and enhance water supply reservoirs,
- Maintain and upgrade all capital facilities as required,
- Implement the water resource conservation practices, and
- Actively participate in the Susquehanna River Basin Commission



The CITY PLAN, as adopted by resolution of the Mayor and City Council and approved by the State of Maryland, Department of the Environment is consistent with the City of Baltimore’s policy for development of water, wastewater, and surface water systems. Adoption of the CITY PLAN as revised and amended shall follow the City’s adoption process as proposed revisions will be presented at public hearings, adopted by resolution of the Mayor and City Council and approved by the MDE.

## **1.2 GOALS TO MEET MARYLAND DEPARTMENT OF PLANNING DRAFT WATER AND SEWER PLANNING PRINCIPLES.**

In 2004, the Maryland Department of Planning prepared a list of draft “Water & Sewer Planning Principles” to assist towns and counties in preparation for annexation, development and growth management regarding water and sewer planning. These include the following:

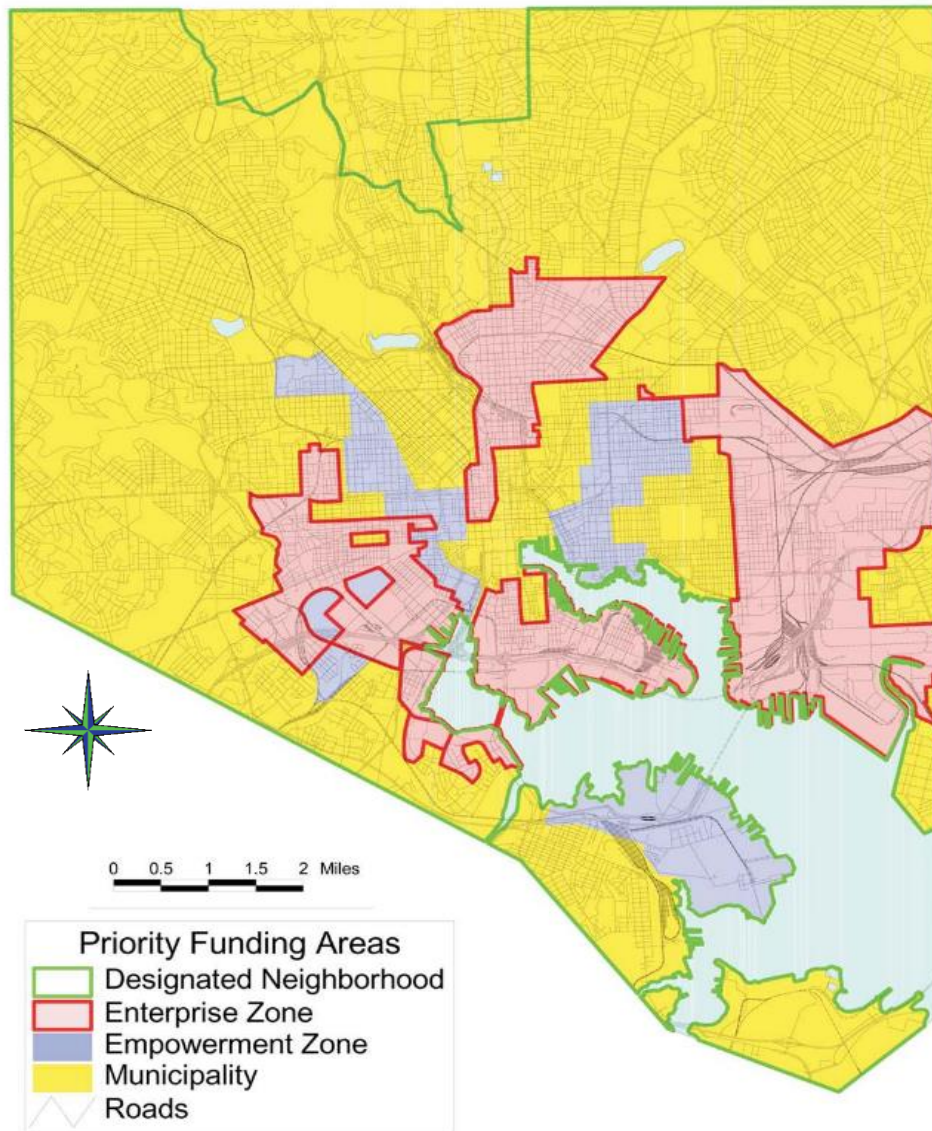
### **1.2.1 PRINCIPLE 1 – Support Smart Growth**

Baltimore City (City) is entirely in a Priority Funding Area (PFA) as shown in Figure 1-1 (Source: Maryland Department of Planning). The City is promoting development by strategically targeting and leveraging investments and supporting improvements that enhance the City’s livability and marketability for homeowners, businesses and tourists. The priority is ensuring that strong renovation and maintenance programs are in place to assure the integrity of the water and wastewater systems.

Unlike surrounding suburban jurisdictions, development in the City, for the large part, takes form in redevelopment and infill development projects. Redevelopment in the City does not generally require increased capacity in the water and wastewater systems and is evaluated on a case-by-case basis. The City maintains an updated and calibrated hydraulic model to evaluate any changes to the system. Demands are projected based on proposed square footage and typical usage rates for the designated land use. The age and condition of existing infrastructure is considered during the assessment. Existing flows and pressures are monitored at the City’s treatment plants, as well as all pumping stations and storage facilities. Future flows are evaluated with the surrounding jurisdictions at their maximum allowable withdrawal limits to assure that capacities for each development are indeed available in relation to all other commitments and increasing flows from other jurisdictions.

Expansion of the systems to service areas in Baltimore County (County) is implemented according to comprehensive long-range planning and is limited in area by the established Baltimore County Metropolitan District (BCMD) and the Urban Rural Demarcation Line (URDL). These boundaries are discussed in more detail in Chapter III. Existing policies, practices, and zoning restrictions support controlled expansion. Public water and wastewater facilities extended into the surrounding counties are subject to approval by Baltimore City. Should an upgrade to the systems be necessary, the counties will fund the improvements if it is determined that the improvement is made solely for the counties benefit. Otherwise, a shared cost is agreed upon between the City and counties.





**FIGURE 1-1: PRIORITY FUNDING AREA**

### **1.2.2 PRINCIPLE 2 – Maintain and Improve Existing Systems**

Maintenance and improvements to existing water and sewer systems are major priorities for Baltimore City, and significant funds are allocated in the annual Capital Improvement Program (CIP) to address ongoing issues such as water distribution system improvements to repair or replace old, broken or damaged appurtenances; the capital sewer maintenance program; sewer rehabilitation and replacement projects; small sewer extensions; and corrections to infiltration and inflow of storm water into sanitary sewers.

Much of the water and wastewater systems that currently serve the City have been in place for many years. Continued maintenance of older mains and appurtenances and installation of new mains and minor appurtenances have met the needs of the system in the past. However, the expanded growth in adjacent counties has created the necessity for major improvement projects to the City's water, wastewater and storm water systems. The City's current six-year CIP provides \$2,553,800,000 for DPW programs. A copy of the FY-2021 CIP with itemized projects and costs for water and wastewater projects is provided in Appendix A as Exhibit A.



### **1.2.3 PRINCIPLE 3 – Manage Service Area Expansions**

As noted in Principle 1, Baltimore City is entirely within a PFA designated area, which cannot be expanded. It is anticipated that the service needs of the City should be the same in ten years as they are today because there is little area for expansion and that rehabilitation of existing structures for redevelopment will not pose a major threat to the existing water or sanitary sewer systems, assuming ongoing maintenance and improvement upgrades continue to be performed as pledged in the CIP. The City also provides treated water to the County, Howard County, and Anne Arundel County, and supplies raw water to Carroll and Harford Counties.

Baltimore County is the largest entity adjacent to the City that utilizes the City public water and sewer facilities. The Urban Rural Demarcation Line (URDL) and BCMD, both of which fall outside the City boundary, limit the area available for expansion in adjacent Baltimore County. As mentioned previously, the URDL and BCMD are discussed in more detail in Chapter III. No expansions to the URDL or BCMD are permitted unless it can be proven that the existing water and/or sewer systems are adequate or there is a health threat. It is a longstanding County policy that the URDL is intended to limit public water and sewer service, even though the BCMD has two larger areas outside the URDL.

### **1.2.4 PRINCIPLE 4 – Expand System Capacity Based on Demonstrated Needs**

Baltimore City and County do not intend to extend water and sewer systems beyond the area established by the URDL. As noted in Principle 1, it has been demonstrated by several redevelopment projects in the City that the changes in use do not necessarily redirect the system capacity and therefore do not materially affect distribution of water or wastewater collection. Early in the planning process, water and sewer systems in the City were created to ensure that adequate capacity would be available to serve the adjacent counties within the boundaries established. Development within those boundaries has been controlled by zoning and jurisdictional regulations in the counties to limit growth. Efficient use of land and public services and orderly development has resulted because of adherence to those boundaries which were created according to population, household and economic projections identified in engineering studies.

There is still room for expansion of the water and sewer systems in the County within the URDL and with Baltimore City approval. Howard, Carroll, and Harford Counties may also be requesting additional expansion of service, but Baltimore City will have control of those expansions as well, based on conditions relating to the available capacity and funding participation established in existing agreements. Anne Arundel County is expected to continue reducing its reliance on the Central System for its water service. Future water demands will be addressed by the rehabilitation and expansion of the Montebello Water Filtration Plants. Existing wastewater facilities have adequate capacity to handle flows and anticipated treatment requirements, with the exception of enhanced nitrogen removal, for which upgraded facilities are currently being provided. Wastewater facility and collection system projects are discussed in Chapter IV.

### **1.2.5 PRINCIPLE 5 – Present a Capital Program Based on Demonstrated Needs**

The annual six-year Capital Improvement Program (CIP) adopted by Baltimore City is the manifestation of research based on the analyses of system needs for new, rehabilitated, or expanded facilities that are identified by long range engineering studies and empirical evidence shown by the condition of existing facilities. Baltimore, Anne Arundel and Howard Counties provide funds for new projects that serve only their own jurisdictions. Baltimore City and the counties coordinate in the effort to address the needs of the entire system and identify projects in their respective CIP programs. The six-year





Baltimore City CIP for FY 2022 to 2027 provides for funds of \$665,797,000 for the water system and \$1,198,232,000 for the wastewater system to address ongoing efforts to sustain the existing system and provide for upgrades to existing facilities.

Chapter III discusses the planned water system improvement projects in more detail and Chapter IV the wastewater system projects. As mentioned previously, the City's current CIP is provided in Appendix A as Exhibit A.

### **1.2.6 PRINCIPLE 6 – Allocate Capacity to Support Smart Growth**

All of Baltimore City is within a PFA designated area; therefore, all allocations for water and wastewater service in the City will meet state PFA requirements. Water supply to adjacent counties is controlled by jurisdictional agreements with the City. These agreements allocate water based on predetermined quantities reached by analyzing land uses, growth projections and zoning restrictions. Wastewater allocations to adjacent counties relative to capacity at the treatment plants are set by the City and enforced through agreements as well. A list of these agreements are incorporated into this PLAN in Appendix A as Exhibit E.

### **1.2.7 PRINCIPLE 7 – Protect Water Quality and Water Supply Sources**

Baltimore City, Baltimore County, Carroll County, Maryland Department of Agriculture (MDA), and Baltimore Metropolitan Council (BMC) signed and affirmed a Reservoir Watershed Management Agreement in which committed them to specific goals, policies, and actions implementing mechanisms intended to protect the quality of the water in the City's three raw drinking water reservoirs: Liberty, Loch Raven and Prettyboy. It was updated in 1990, reaffirmed in 2003 and recently updated in 2021. The BMC, funded by the signatories to the agreement, provides coordination and program administration to the Reservoir Watershed Protection Committee and the Reservoir Watershed Technical Group who work towards meeting the goals of the agreement. Those goals are:

- Prevent increased phosphorous and sediment loadings into the Liberty, Loch Raven and Prettyboy reservoirs,
- Reduce current phosphorous loadings in the reservoirs to acceptable levels as soon as possible.

Baltimore City also owns and manages 17,580 acres of forested watershed immediately surrounding each reservoir, which provides critical protection from certain direct runoff loads.

In another ongoing effort to address water quality concerns related to forestry activities in the City's watersheds, the City authorized the Maryland Department of Natural Resources to develop a Forest Management Plan. In 2002, a report was delivered to the City. More detailed information on this effort is provided in Chapter III.

In addition, the City is currently taking the necessary steps to meet the requirements of the Stage 2 Disinfection and Disinfection Byproducts Rule (D/DBR) and the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR). These measures are being taken to ensure the ability to comply with current and future drinking water regulations.

The Bay Restoration Fund allows Maryland to achieve more nutrient reductions through upgrading wastewater treatment plants with enhanced nitrogen removal, upgrading septic systems in critical areas, and implementing cover crop on agricultural land. Baltimore City has completed projects at both the Back River and Patapsco plants that achieve enhanced nutrient removal (ENR). Chapter IV will address more specifics on the Patapsco WWTP and Back River WWTP ENR projects.



### 1.2.8 PRINCIPLE 8 – Assure Adequate User Structure Rate

The City's water and wastewater systems require ongoing maintenance of existing piping and facilities associated with operation of the system. The water filtration plants and wastewater treatment plants, as well as pumping stations and other large facilities, are continuously being updated to keep pace with regulatory demands and to improve system and facility performance as identified by population projections and the latest technologies. Maintenance of facilities is an ongoing effort funded by allocated funds in the City's CIP and Operating Budget. In addition, the City is upgrading and correcting existing deficiencies in the sanitary sewer system as obligated by a Consent Decree.

Baltimore City's user rate structure incorporates both anticipated capital project costs as well as operating and maintenance expenses necessary for proper water and wastewater system maintenance. The City has substantially increased both the capital and operating budget expenditures to address the aging infrastructure and to comply with requirements of the wastewater system Consent Decree. In order to pay for anticipated water and wastewater system maintenance costs, the City has developed a financial plan for the utilities that calls for annual rate increases. Historically, the City has raised water and wastewater rates substantially over that last two decades to meet the increased costs of water and wastewater system integrity, as shown by the historical rate increases below in Table 1-1.

Retail and Wholesale Water/Wastewater Rate Increases					
Water			Wastewater		
Date		% Increase	Date		% Increase
June	2010	9.0	July	2010	9.0
May	2011	9.0	July	2011	9.0
June	2012	9.0	July	2012	9.0
July	2013	15.0	July	2013	15.0
July	2014	11.0	July	2014	11.0
July	2015	11.0	July	2015	11.0
October	2016	9.9	October	2016	9.0
July	2017	9.0	July	2017	9.0
July	2018	9.0	July	2018	9.0
July	2019	9.0	July	2019	9.0
July	2020	9.9	July	2020	9.0
July	2021	9.9	July	2021	9.0
July	2022	9.9	July	2022	9.0

TABLE 1-1 HISTORICAL RETAIL AND WHOLESALE WATER RATE INCREASES

### 1.2.9 PRINCIPLE 9 – Incorporate Subsidiary Plans

The City's systems encompass all of Baltimore City and all public water and wastewater service within the URDL in Baltimore County. The City's water distribution and wastewater collection systems also serve eastern portions of Howard County and northern parts of Anne Arundel County. The City's sources also provide raw water to Carroll and Harford Counties. These counties are full partners in the planning process which assures that their operating and capital programs, allocation policies and practices, as well as service areas, are reflected in all the Water and Wastewater Plans. Future service areas in the counties are well established and mutual approval by the individual counties and Baltimore City must be obtained before a change can be implemented. A summary of each of the other county Water and Wastewater Plans is provided in Chapter 2.



### 1.3 CITY WATER AND WASTEWATER UTILITIES

Under the Metropolitan District Act (established by the Acts of the General Assembly of Maryland of 1924, Chapter 539) the Baltimore County Metropolitan Sewer and Water Operating District (the “Metro District”) was created as a separate and financially self-supporting entity under the jurisdiction of the County to supply water and to provide sewer and wastewater systems to residents of the County living within certain prescribed areas primarily in the most densely populated areas. The Metropolitan District Act requires the City of Baltimore (the “City”) to provide water to the Metro District at cost. Although the Metro District constructs water facilities within its boundaries, under an agreement between the City and the County, the City maintains and operates the facilities at cost, including billing and collecting water usage. Under said agreements, the City and the County have also agreed to pay for certain new capital projects and the repair and enlargement of additions or improvements to certain existing water facilities on a specified pro-rata basis. In addition, the City, from time to time, has entered into agreement with adjacent Anne Arundel and Howard counties under which certain water facilities are made available to each of said counties. For such use, these other jurisdictions have agreed to pay for a pro-rata share of capital and operating costs.

The City of Baltimore’s Department of Public Works (DPW) is responsible for the management and operation of the water and wastewater systems as well as expending capital budget for the CIP. The organization of DPW includes two Bureaus (Bureau of Water and Wastewater and Bureau of Solid Waste). The day-to-day management and operation of the water and wastewater systems is assigned to the Bureau of Water and Wastewater and implemented through the following Divisions:

- **Office of Engineering and Construction (OEC)** is responsible for planning and directing the feasibility of the City design, construction, contract administration, and inspection of utility infrastructure, dams, bridges, and water and wastewater treatment facilities. The OEC also reviews and inspects construction to assure adherence to codes, costs, progress and quality as programmed in the DPW capital improvement plan. OEC is responsible for engineering design for contracts to construct and maintain water and wastewater treatment plants, pumping stations, and the collection and conveyance systems. The OEC recommends and monitors the CIP’s for the Water Utility, the Wastewater Utility, and the Stormwater Utility; reviews development plans and construction drawings; coordinates design and construction of the water and wastewater treatment plants; and provides technical assistance to the Bureau of Water and Wastewater, Utility Maintenance Division.
- **Office of Asset Management** is responsible for developing a plan to maintain a sustainable cost structure while increasing efficiency and reliability of the City’s aging water, wastewater and storm water infrastructure through the following core objectives:
  - Maximizing utility life and capacity
  - Minimizing system failures
  - Maintaining compliance with Federal and State regulations
  - Providing a sustained level of service to customers
  - Developing a sustainable funding strategy
- **Water Facilities Division** (formerly Division of Environmental Services) is responsible for the storage, treatment, and pumping of drinking water to the Baltimore metropolitan area.



Additional responsibilities include reservoir water quality management, industrial pollution control and bacteriological examinations of surface waters. This division has the environmental water quality laboratories at Montebello and Ashburton Water Filtration Plants.

- **Wastewater Facilities Division** is responsible for the operation and maintenance of the wastewater treatment plants and pumping stations. This division also has the environmental laboratories at Back River and Patapsco Wastewater Treatment Plants.
- **Utility Maintenance Division (UMD)** is responsible for maintenance of water, wastewater and storm water utilities. With respect to the Water Utility, the Division maintains approximately 3,400 miles of main in the water distribution system in Baltimore City and the County. In regard to the Wastewater Utility, the Division maintains over 1,340 miles of sanitary interceptors and main line sewers, over 35,400 individual sanitary manholes, and over 210,000 sanitary house connections in Baltimore City.

The following Offices are overseen by the Office of the Director of Public Works:

- **Office of Compliance and Research** is responsible for ensuring compliance with all Federal and State regulations, the investigating and sampling of potential water quality issues, and maintaining a high standard of environmental performance at all of the Department's facilities and operations.
- **Office of Fiscal Management** is responsible for the preparation and monitoring of DPW's operating and capital budgets, rates and financial forecasting, capital project financing, procurement and inter-jurisdictional cost sharing agreements.
- **Division of Customer Support and Services** is responsible for providing quarterly meter reading and billing of approximately 412,000 retail accounts. The five components are Utility Billing, Meter Reading Operations, Meter Shop Operations, Control One Abatement Center and the Correspondence Unit. The core activities include the installation and maintenance of water meters, meter reading, delinquent turn offs, account billing, billing audits and adjustments, informal hearings, and service discount programs. The Customer Care section of Utility Billing manages water service inquiries and escalated billing complaints through the call center and one stop shop.



## Baltimore City Department of Public Works

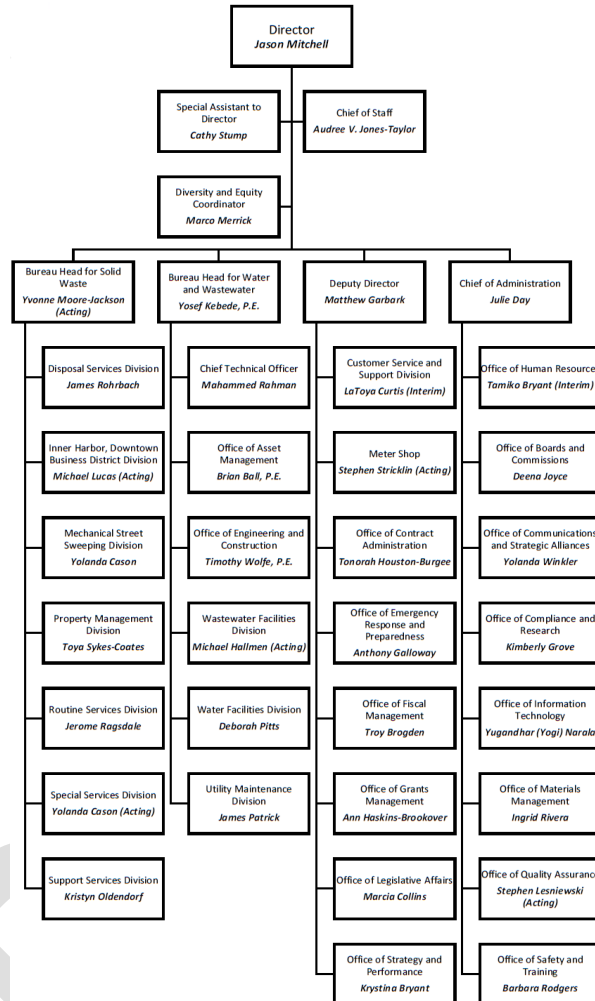


FIGURE 1-2 DEPARTMENT OF PUBLIC WORKS ORGANIZATIONAL CHART

### 1.4 DEFINITIONS

The following are definitions of terms used within the Comprehensive Water and Wastewater Plan (CITY PLAN), as provided in Regulation 26.03.01 of the State Department of the Environment's Regulations for Planning Water Supply and Sewerage Systems:

- A. "CITY PLAN" – a comprehensive plan for the provision of adequate water supply systems and sewerage systems, whether publicly or privately owned, throughout the City and all amendments and revisions thereto.
- B. "APPROVING AUTHORITY" – one or more officials, agents, or agencies of local government designated by the local governing body or specified by other provisions of Title 9, Subtitle 5, County Water and Sewerage Plans to take certain actions as part of implementing this section.
- C. "DEPARTMENT" – The State Department of the Environment.
- D. "A SEWERAGE SERVICE AREA" – that area served by, or potentially served by, a system of sanitary sewers connected to a treatment plant, or in a very large system, sub-area as delineated by the county.



- E. "A WATER SERVICE AREA" – that area served by, or potentially served by, a single distribution system under control of a single utility, or in a very large system, sub-areas as delineated by the county.  
"COMMUNITY SEWERAGE SYSTEM" – any system, whether publicly or privately owned, serving two or more individual lots, for the collection and disposal of sewerage or industrial wastes of a liquid nature, including various devices for the treatment of such sewage and industrial waste.
- F. "COMMUNITY WATER SUPPLY SYSTEM" – a source of water and distribution system, including treatment and storage facilities, whether publicly or privately owned, serving two or more individual lots.
- G. "MULTI-USE SEWERAGE SYSTEM" – a single system serving a single lot, whether owned or operated by an individual or group of individuals under private or collective ownership and serving a group of individuals for the collection and disposal of sewage or industrial wastes of a liquid nature. Various devices for the treatment of such sewage and industrial wastes having a treatment capacity in excess of 5,000 GPD are included.
- H. "MULTI-USE WATER SUPPLY SYSTEM" – a single system of piping, pumps, tanks, or other facilities utilizing a source of ground or surface water to supply a group of individuals on a single lot and having a capacity in excess of 5,000 GPD.
- I. "INDIVIDUAL SEWERAGE SYSTEM" – a single system of sewers and piping treatment tanks or other facilities serving only a single lot and disposing sewage or industrial wastes of a liquid nature, in whole or in part, on or in soil of the property, into any waters of this State, or by other methods.
- J. "INDIVIDUAL WATER SUPPLY SYSTEM" – a single system of piping, pumps, tanks, or other facilities utilizing a source of ground or surface water to supply only a single lot.
- K. "NON-POINT SOURCE" – pollution originating from land run-off where no specific outfall can be identified.
- L. "EXISTING SERVICE AREA" – means that area which is currently served.
- M. "UNDER CONSTRUCTION" – a work or works of community water supply and community sewerage systems where actual work is progressing or where a notice to proceed with a contract for such work has been let as the adoption date of this plan, its amendment, or revision.
- N. "FINAL PLANNING STAGES" – a work or works of community water supply or sewerage systems for which contract plans and specifications have been completed.
- O. "IMMEDIATE PRIORITY" – a work or works of community water supply or sewerage systems for which the beginning of construction is scheduled to start within 2 years following the date of adoption of the plan, its amendment and revision thereof.
- P. "FIVE OR SIX-YEAR PERIOD" – that period, depending upon the City's Capital Improvement Program, 5 or 6 years following the date of adoption of the plan, its amendment or revision by the City.
- Q. "TEN-YEAR PERIOD" – that period of the 6 or 7 through 10 years following the date of adoption of the plan, its amendment or revision by the City.
- R. "RNRS" – Baltimore City Reservoir and Natural Resources Section.





## **CHAPTER 2 – CITY OF BALTIMORE BACKGROUND INFORMATION**

### **2.1. GENERAL**

Baltimore City is the core of a metropolitan area extending into five adjacent counties (Anne Arundel, Baltimore, Carroll, Harford, and Howard) which has approximately 2,662,691 inhabitants based on the 2010 Census. The City includes 92 square miles, 13 of which are water-covered. The City and surrounding counties have a combined total area of 2,592 square miles, 2,236 of which are land covered. A reference map of Baltimore's Neighborhood Statistical Areas is located in Appendix A as Exhibit C.

In the heart of the Mid-Atlantic region, the port city of Baltimore is a dynamic urban center fueled by a diverse economy, internationally renowned universities and medical centers, and an extraordinary collection of historic and cultural resources. Industries such as health care and life sciences, international finance and banking, hospitality and entertainment, and maritime commerce attract a highly educated and productive workforce that includes one of the nation's highest concentration of residents with advanced degrees.

### **2.2 PHYSICAL**

Figure 2-1 summarizes the general topographic characteristics of Baltimore City. The land area of Baltimore City is split into two physiographic regions: the Piedmont Plateau and the Atlantic Coastal Plain as shown in Figure 2-2. The separation is roughly parallel to the Chesapeake Bay shore, through western Baltimore City in a northeast – southeast direction. The boundary of the two physiographic regions is called the "Fall Line". The Piedmont Plateau is characterized by underlying Precambrian crystalline rocks: gabbro, schist, granite, and gneiss. The land surface is higher and more rugged than that of the coastal plain due to the greater resistance to erosion. The Piedmont aquifer provides a relatively poor water supply, because water is contained in joints and fractures in the rock, leading to irregular and non-homogeneous water bearing zones. The coastal plain is characterized by underlying soft, unconsolidated sediments of the Lower Cretaceous, Upper Cretaceous and Pleistocene ages. The sediments of the Upper and Lower Cretaceous may be divided into three formations: the Patuxent formation (Lower Cretaceous) and the Anne Arundel clay and Patapsco formations (Upper Cretaceous). Both the Patuxent and Patapsco are important water bearing formations. Soil drainage classes are depicted in Figure 2-3. Figure 2-4

Owing to the great difference in water-bearing properties of the crystalline rocks in the Piedmont Plateau and the unconsolidated sediments in the Coastal Plain, ground water in the Baltimore region occurs under two widely different sets of conditions. In the crystalline rocks, the water is contained chiefly in joints and other fractures which are not uniform in size and gradually disappear with depth. Consequently, the water-bearing zones are very irregular and non-homogeneous. The sand and gravel in the Coastal Plain sediments are considerably more porous and permeable and form relatively uniform and widespread aquifers. Except in areas of outcrop, the water in the water-bearing formations in the Coastal Plain occurs under artesian conditions. Development of ground water supplies within Baltimore City was for the most part limited to industrial use. The use of ground water resources in the Baltimore area reached a peak in 1942. Salt water intrusion and acid contamination resulted in a continuous decline in ground water use.

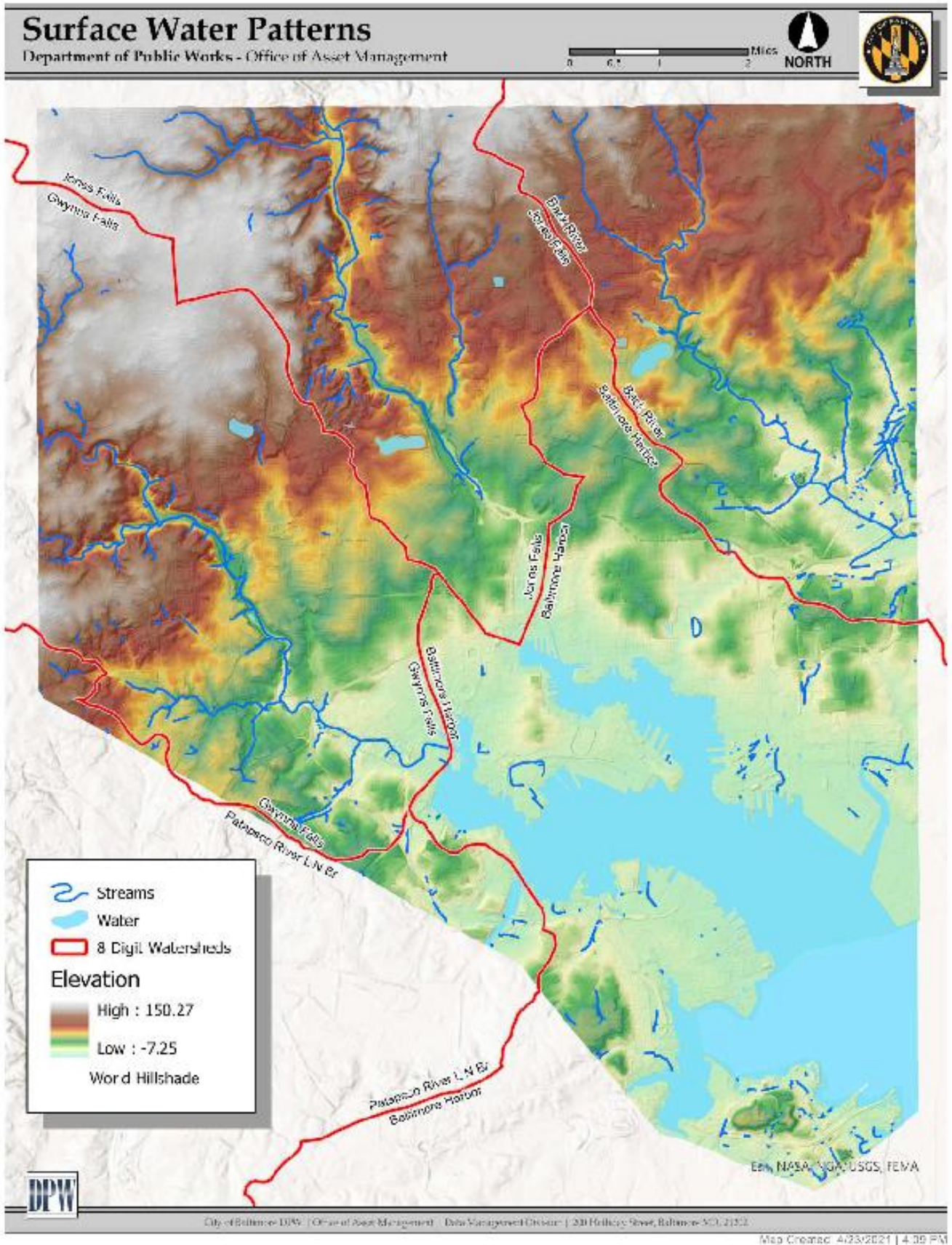


FIGURE 2-1: GENERALIZED TOPOGRAPHY & WATER SURFACE PATTERNS



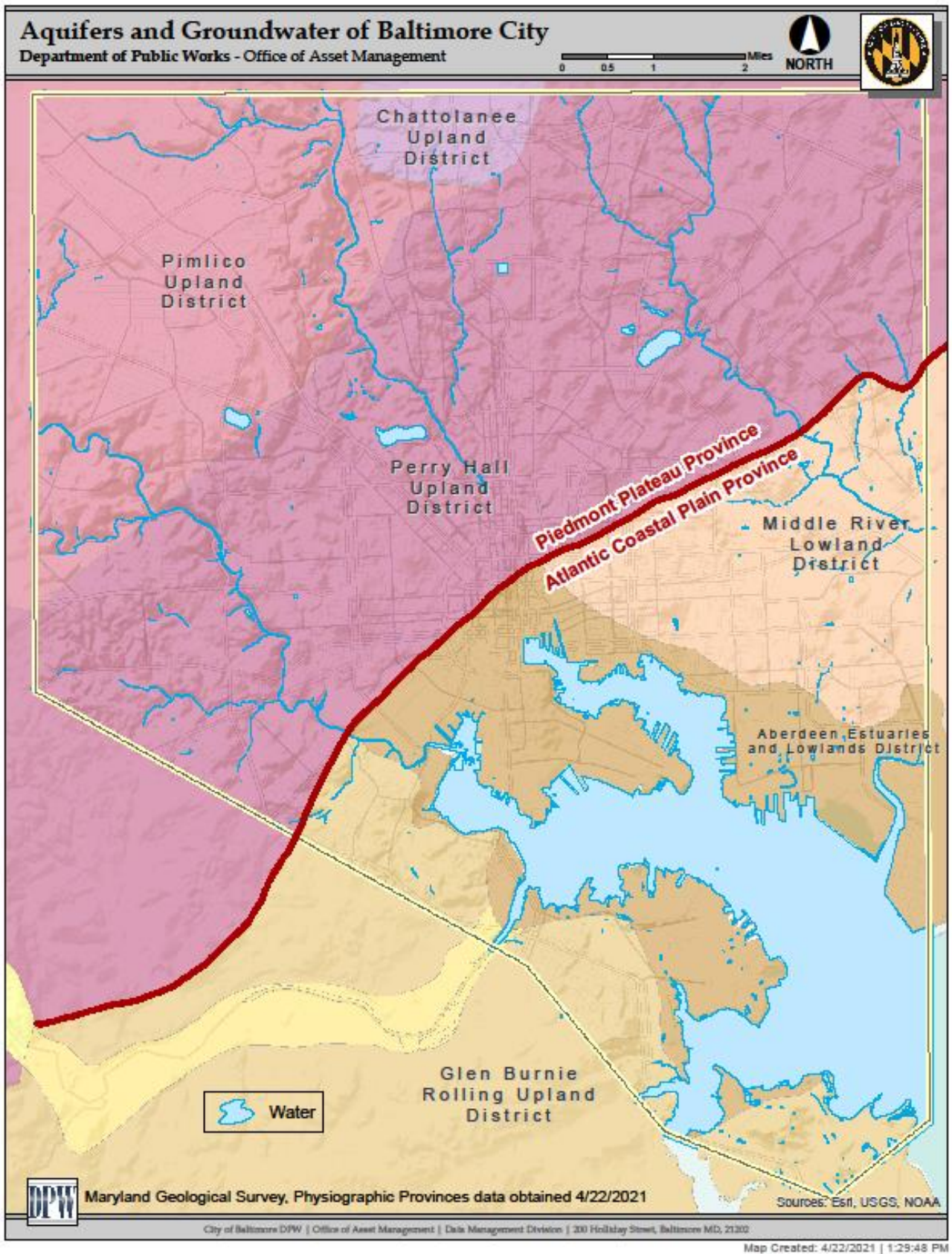
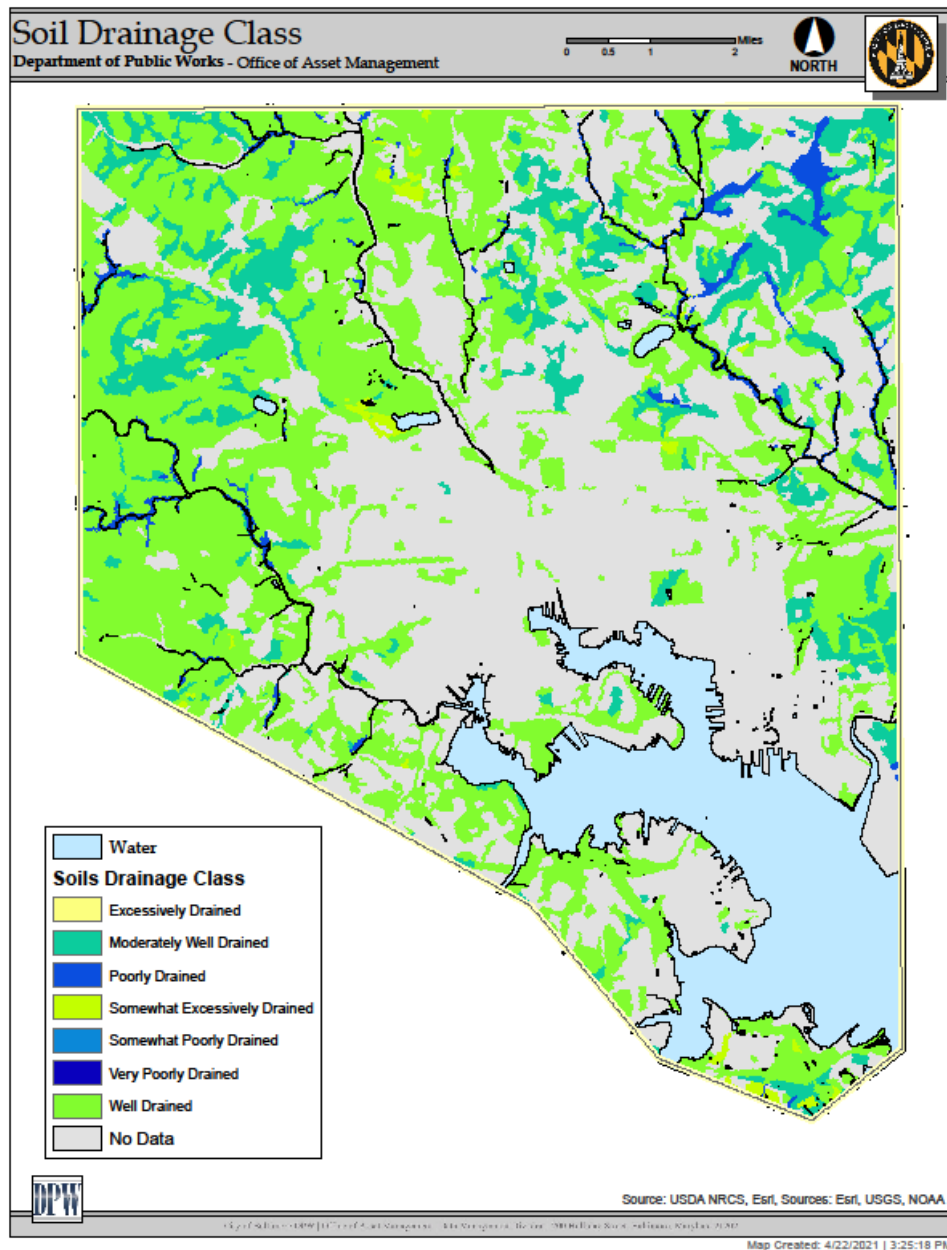


Figure 2-2: Aquifers and Ground Water of Baltimore City



**Figure 2-3: Soil Drainage Classes in Baltimore City**

Baltimore City lies entirely within two major watersheds, the Patapsco River Basin and the Back River Basin. The total drainage area of the two river basins is 672 square miles. Of the total drainage area, 238 square miles are in Baltimore County, 200 square miles in Carroll County, 89 square miles in Baltimore City, 85 square miles in Anne Arundel County, and 60 square miles in Howard County. The City works in concert with the Chesapeake Bay Program initiatives and addresses the impact of elements such as total maximum daily loads (TMDLs) that affect the waterways negatively. Major measures have been undertaken at the two wastewater treatment plants in the City to achieve enhanced nutrient removal (ENR) as discussed in more detail in Principle 7 of chapter 1.



The surface waters of Baltimore City are designated as Class I or Class IV waters by the Maryland Department of Health and Mental Hygiene (DHMH). Class I waters are to be protected for use as water contact recreation, for fish and other aquatic life and for wildlife. Class IV waters are designated recreational trout waters capable of holding or supporting adult trout for put and take fishing and managed as a special fishery by periodic stocking and seasonal catching. Only the stream listed here has been designated as Class IV, South Branch Patapsco River, mainstream only. Water quality standards have been developed for Class I and Class IV waterways and can be obtained through the DHMH. City of Baltimore Surface Water Use Classes are depicted in Figure 2-4.

## 2.3 POPULATION

The population projections for Baltimore City covering the time span from the last census in 2010 to the year 2040 are presented in Table 2-1. Maps illustrating the population distribution and density are presented in Figures 2-5 through 2-16. Located in Appendix A as Exhibit D, is a report highlighting the population changes in Baltimore City between the 2000 and 2010 Census' (Source: City of Baltimore Department of Planning).

Year	Population	Source
2000	651,154	2000 US Census Bureau
2010	620,961	2010 US Census Bureau
2020	616,300	Maryland State Data Center
2025	618,300	Maryland State Data Center
2030	625,100	Maryland State Data Center
2035	627,300	Maryland State Data Center
2040	643,400	Maryland State Data Center

**TABLE 2-1: POPULATION PROJECTIONS FOR BALTIMORE CITY**

The Table 2-2 shows population data for the Baltimore Metropolitan Area. Population projections were compiled from Maryland State Data Center.

	<u>2010</u> Census	<u>2020</u>	<u>2025</u>	<u>2030</u>	<u>2035</u>	<u>2040</u>
<b>BALTIMORE REGION</b>	<u>2,662,691</u>	<u>2,800,350</u>	<u>2,851,950</u>	<u>2,897,800</u>	<u>2,934,300</u>	<u>2,989,250</u>
Anne Arundel County	537,656	573,250	584,400	596,700	608,950	622,250
Baltimore County	805,029	847,000	857,000	862,200	869,500	880,750
Carroll County	167,134	169,200	171,700	175,150	178,500	181,800
Harford County	244,826	257,700	264,850	271,850	280,550	289,200
Howard County	287,085	336,900	355,700	366,800	369,500	371,850
Baltimore City	620,961	616,300	618,300	625,100	627,300	643,400

**TABLE 2-2: BALTIMORE METROPOLITAN AREA POPULATION DATA\***

\*Table 2-2 data has been obtained from Maryland State Data Center update August 2017.

\*Population data throughout the Plan has been obtained from different current sources which don't always agree with other counties' published plans.



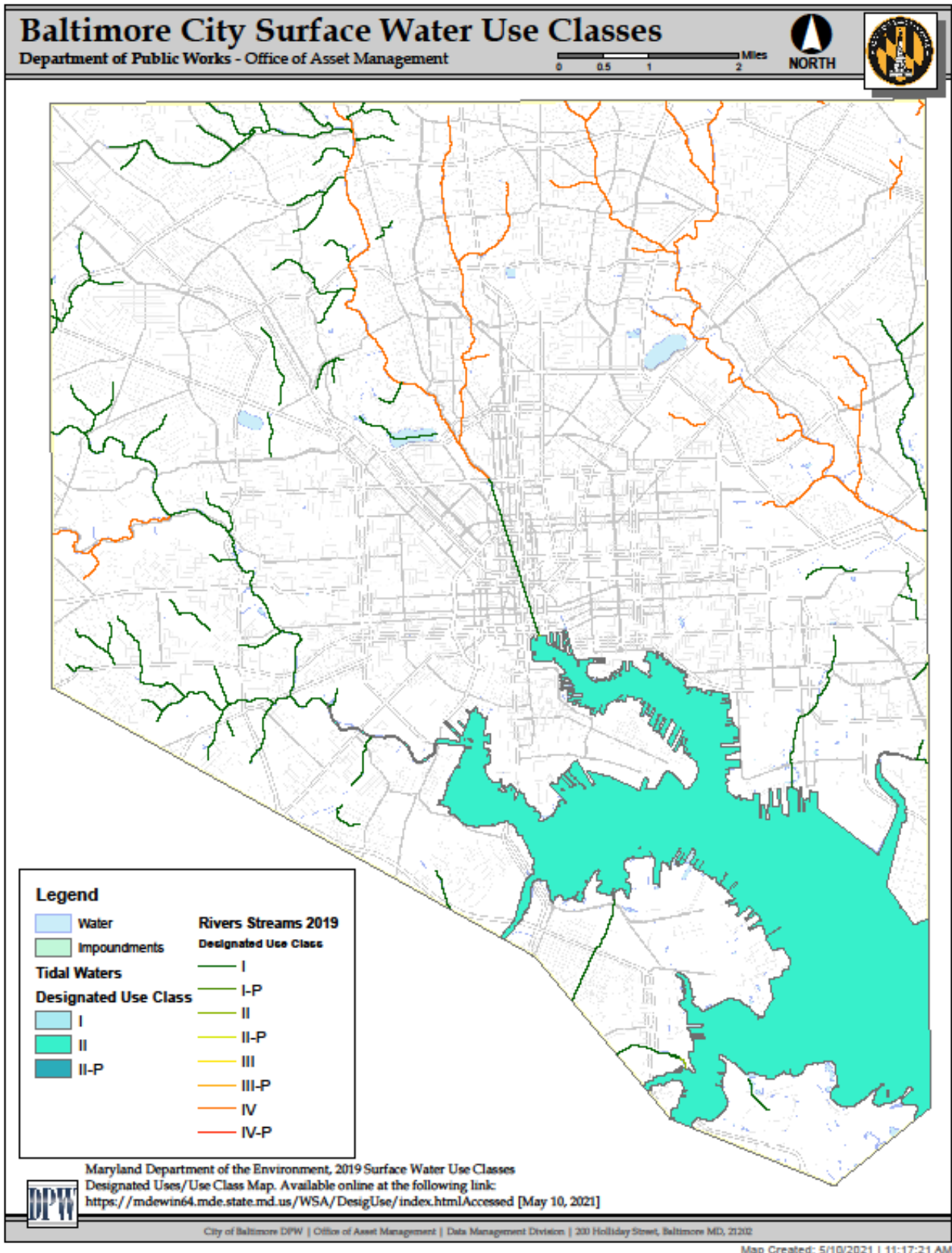


FIGURE 2-4: Water Quality Criteria, City of Baltimore



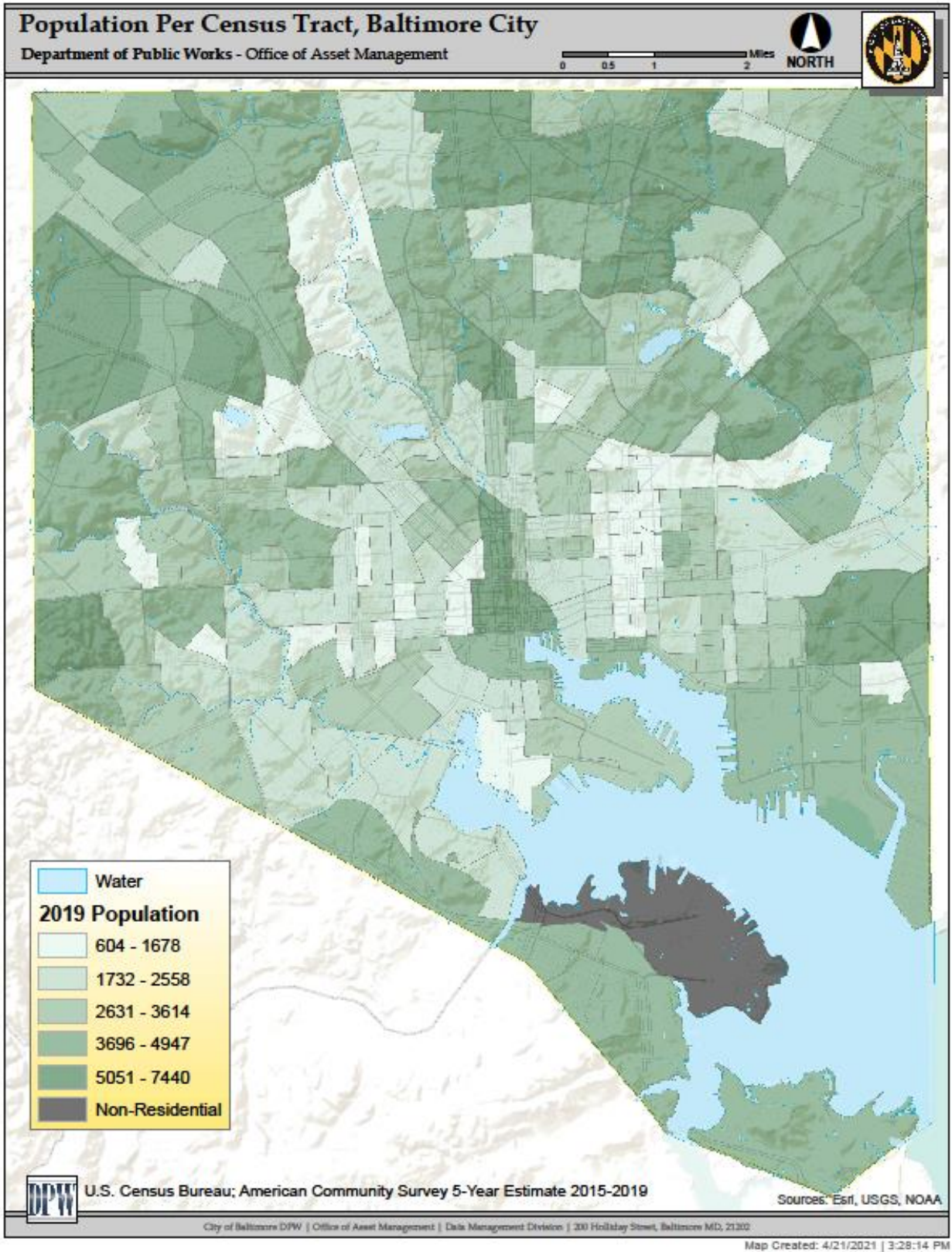


FIGURE 2-5: POPULATION DISTRIBUTION 2019



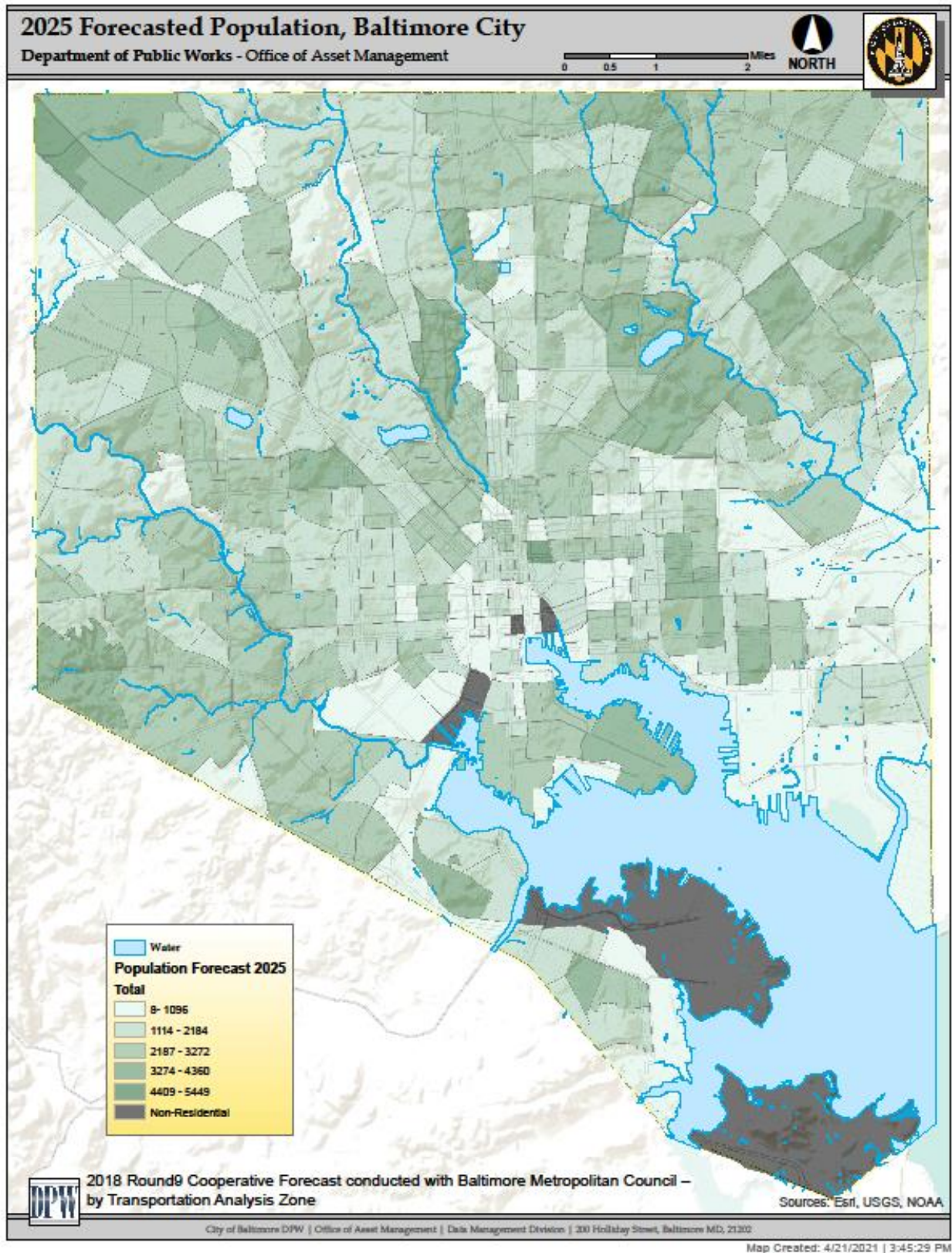


FIGURE 2-6: POPULATION DISTRIBUTION 2025



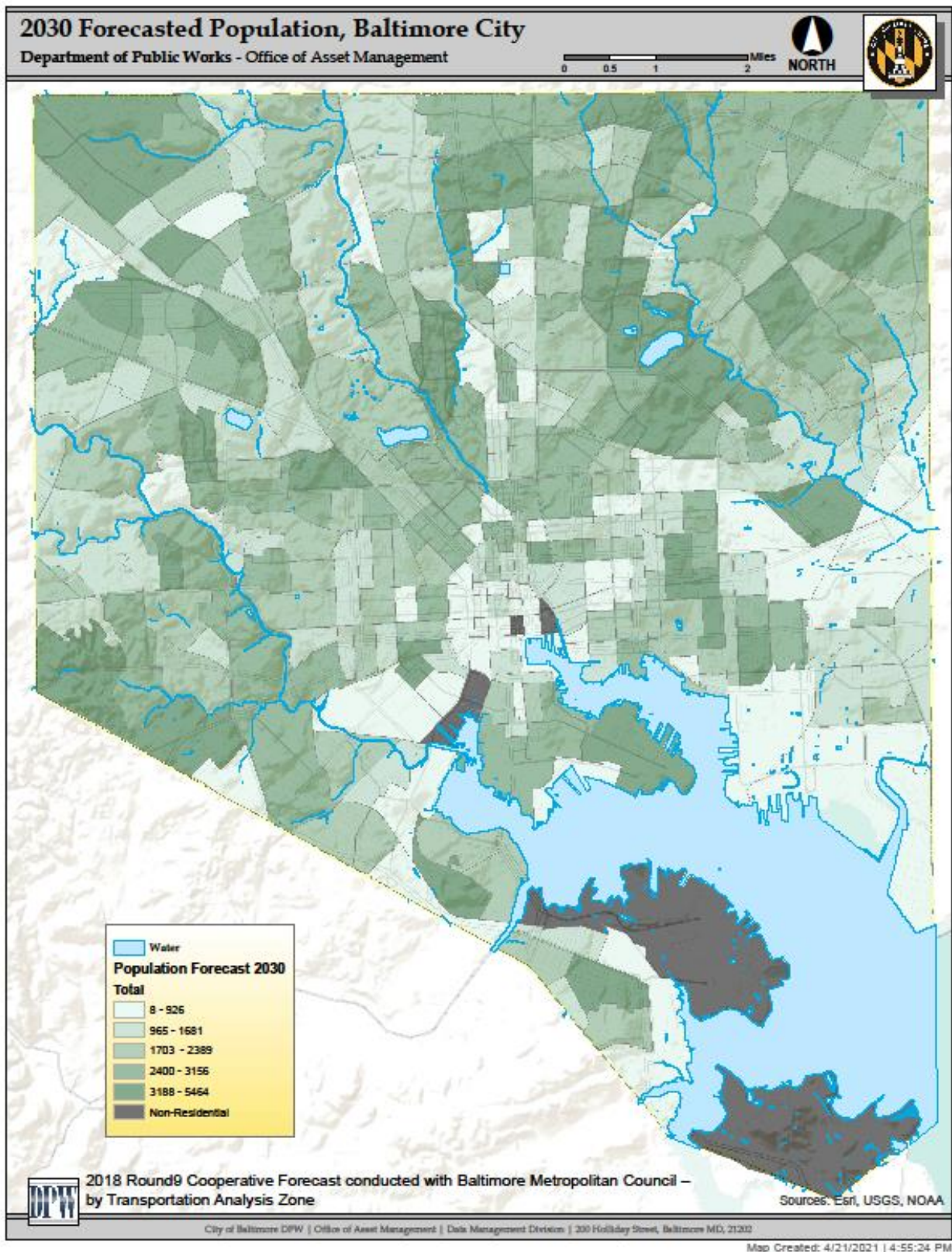


FIGURE 2-7: POPULATION DISTRIBUTION 2030



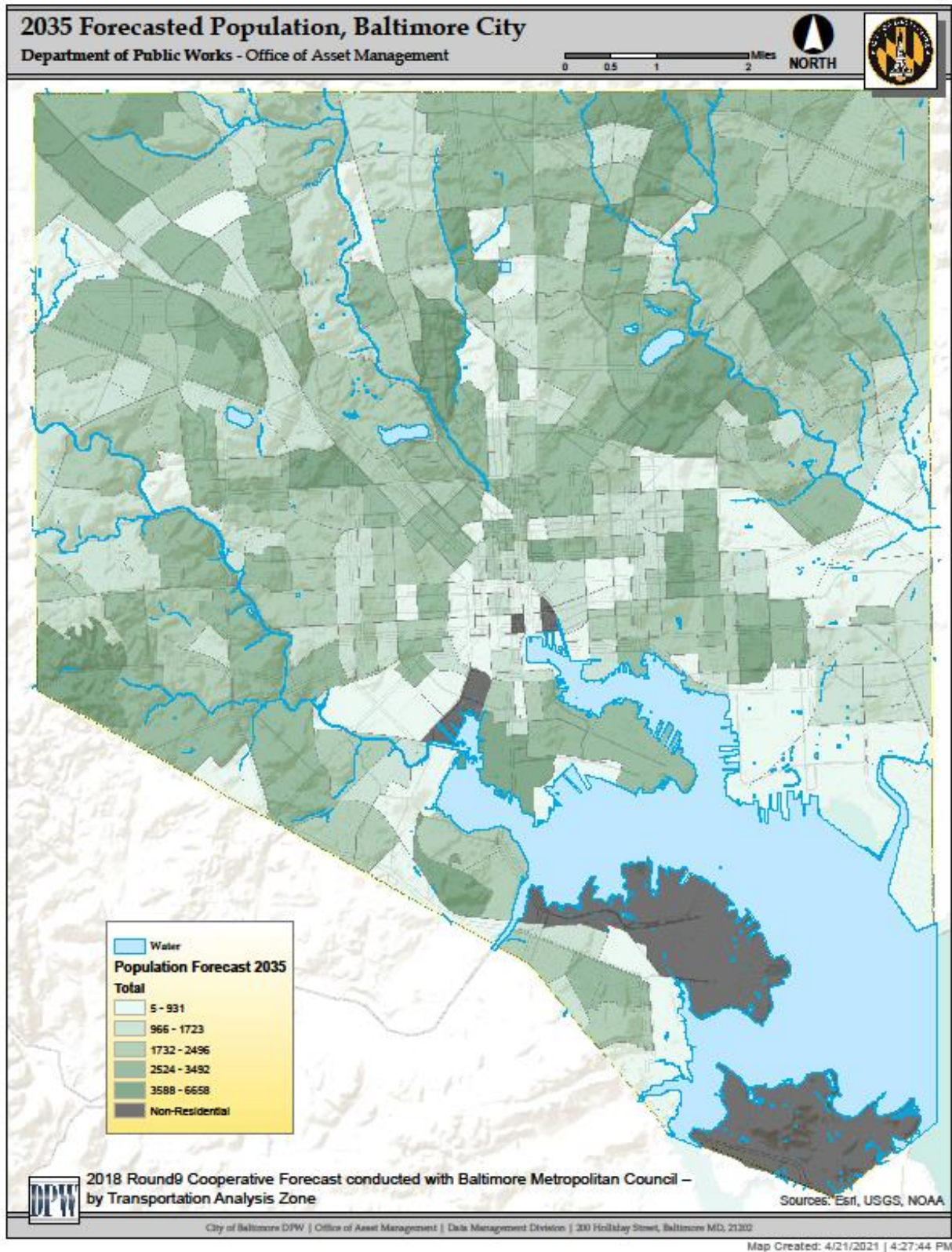


FIGURE 2-8: POPULATION DISTRIBUTION 2035



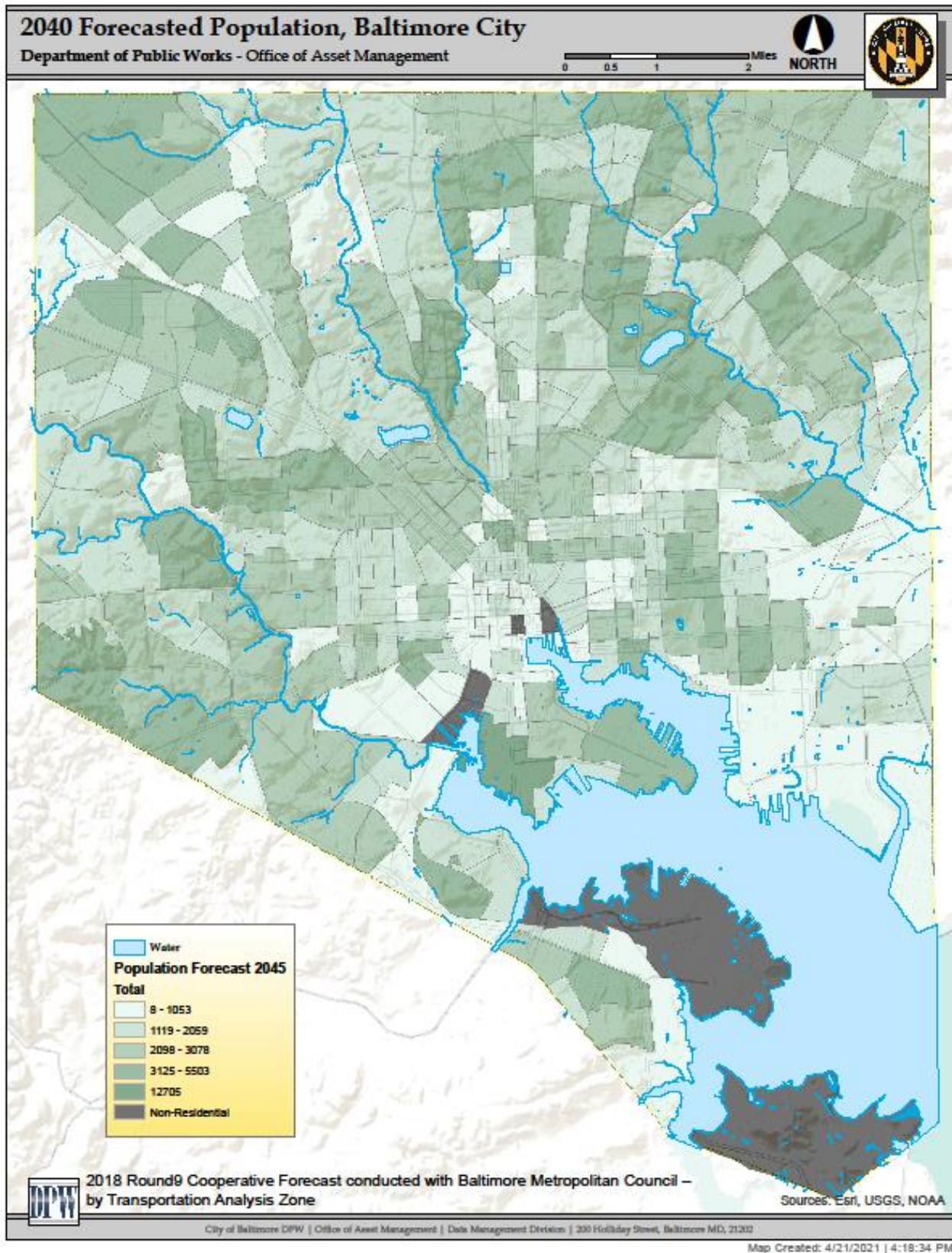


FIGURE 2-9: POPULATION DISTRIBUTION 2040



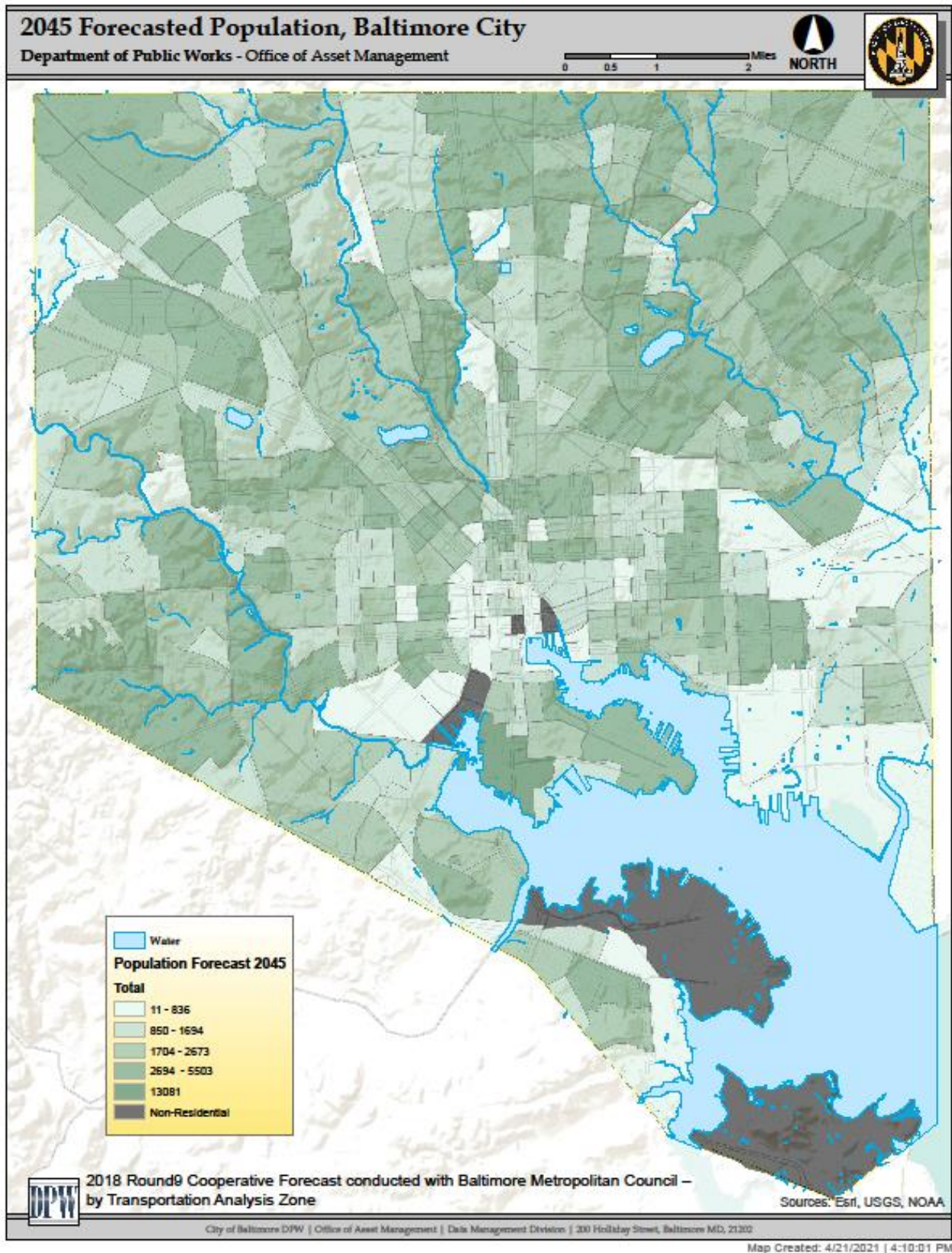
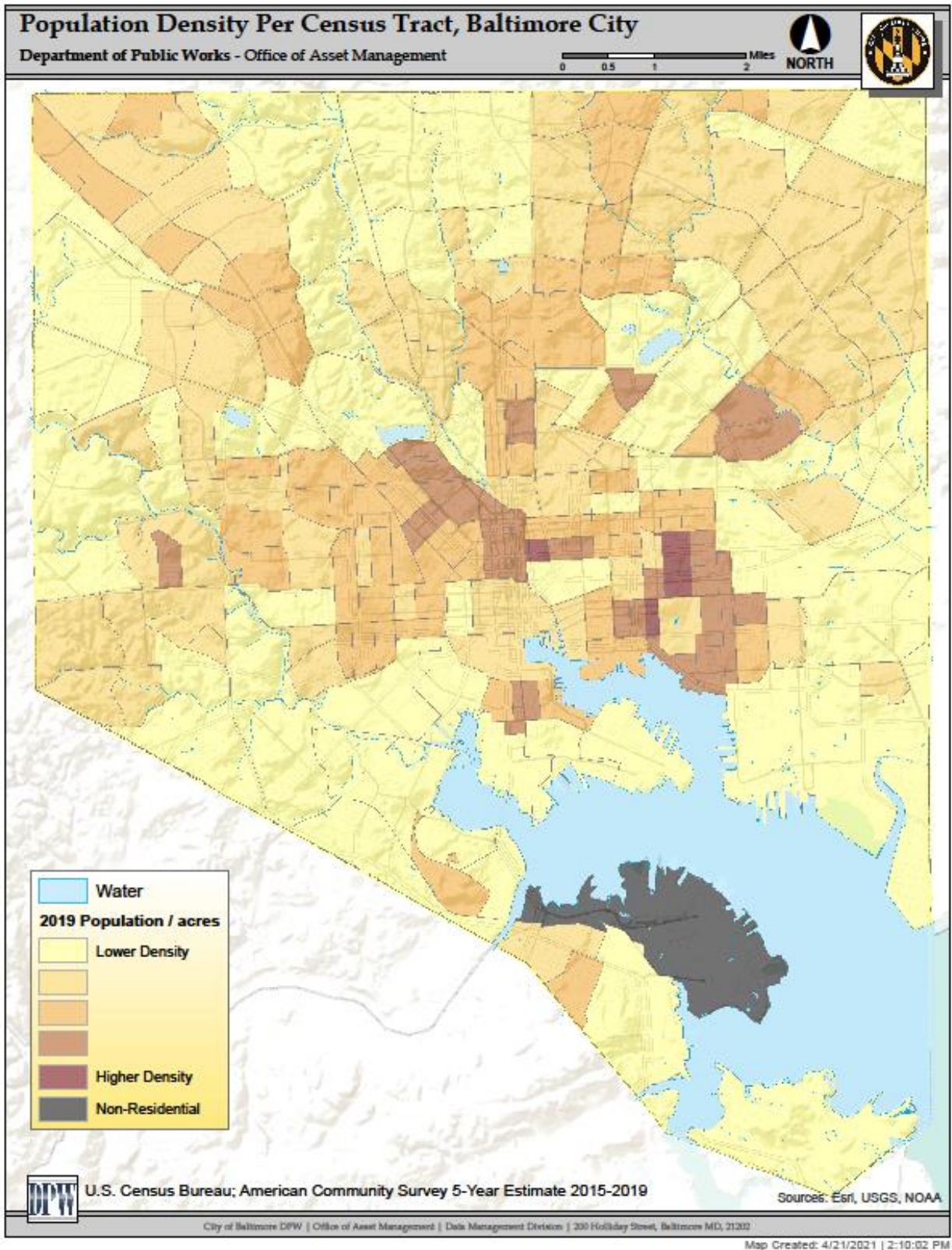


FIGURE 2-10: POPULATION DISTRIBUTION 2045





**FIGURE 2-11: POPULATION DENSITY 2019**



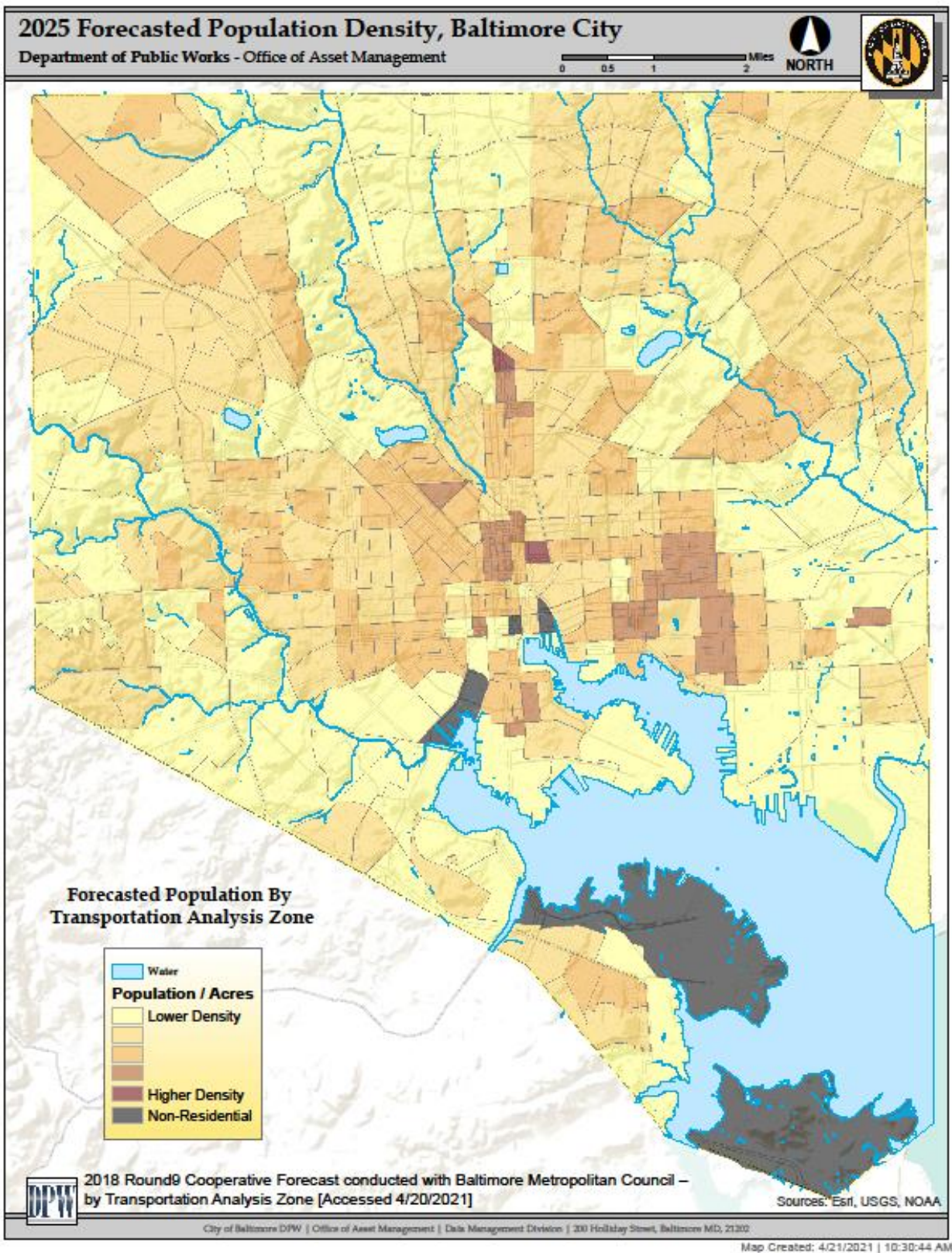


FIGURE 2-12: POPULATION DENSITY 2025

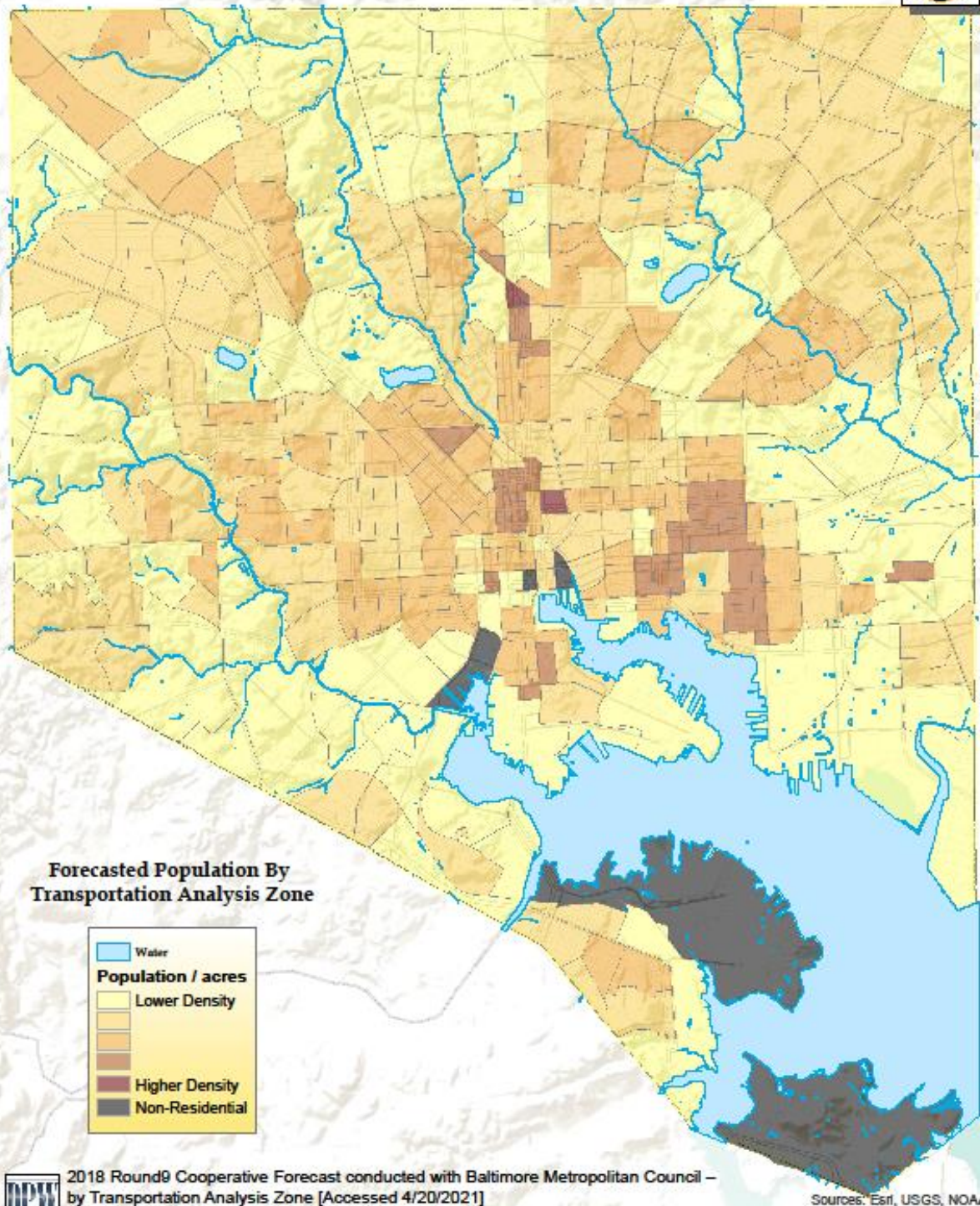




## 2030 Forecasted Population Density, Baltimore City

Department of Public Works - Office of Asset Management

0 0.5 1 2 Miles



City of Baltimore DPW | Office of Asset Management | Data Management Division | 300 Holliday Street, Baltimore MD, 21202

Map Created: 4/21/2021 | 10:25:41 AM

FIGURE 2-13: POPULATION DENSITY 2030



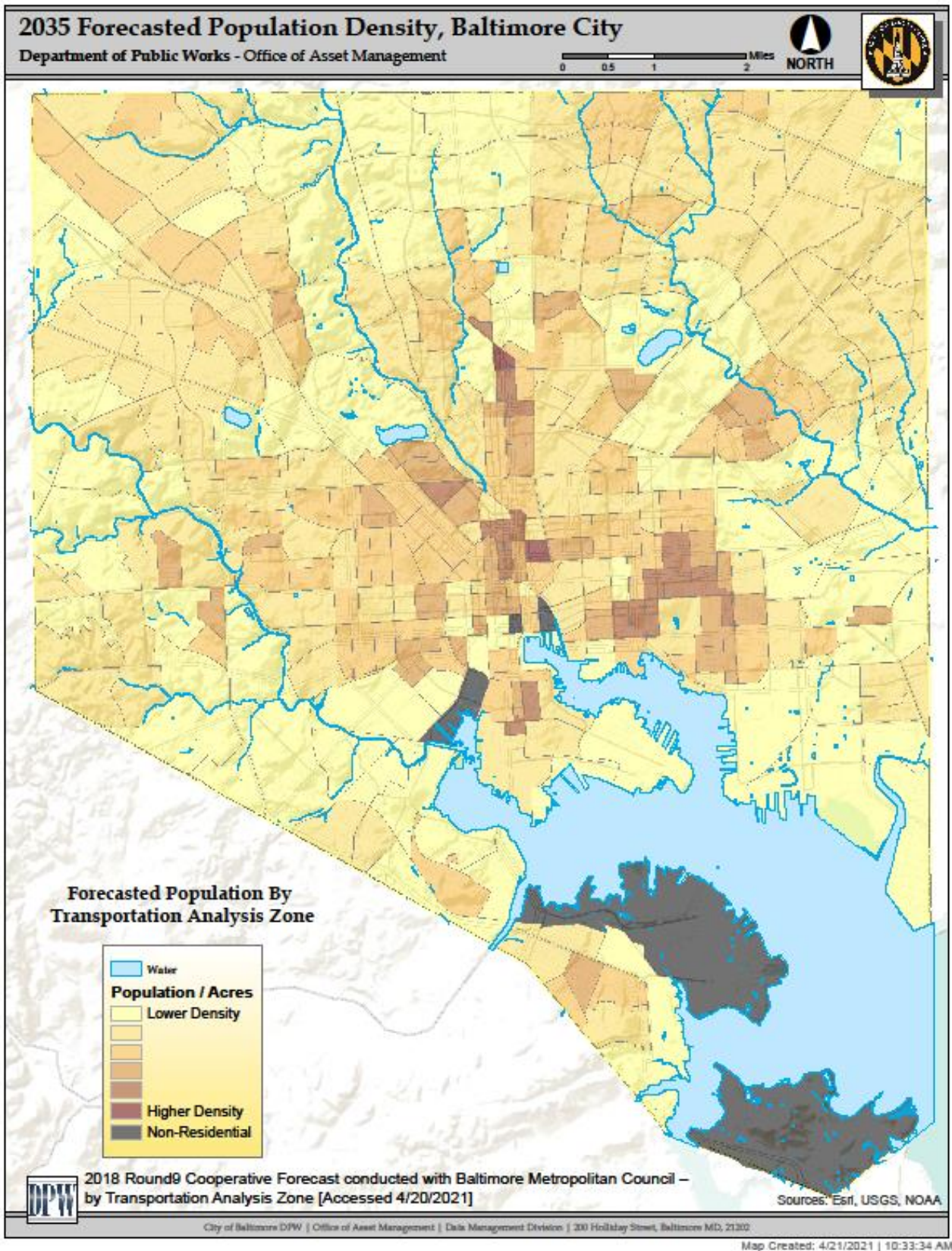


FIGURE 2-14: POPULATION DENSITY 2035



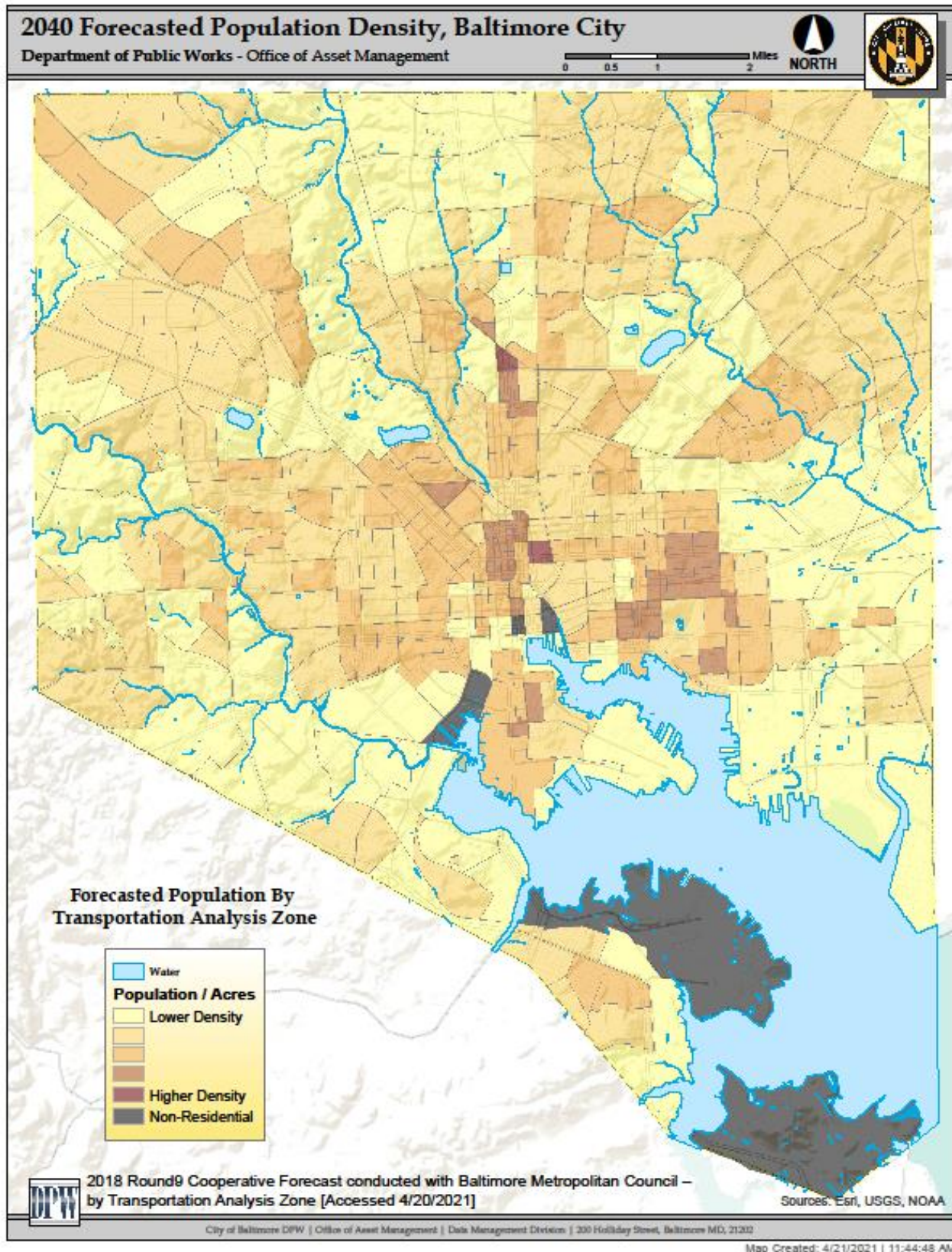


FIGURE 2-15: POPULATION DENSITY 2040



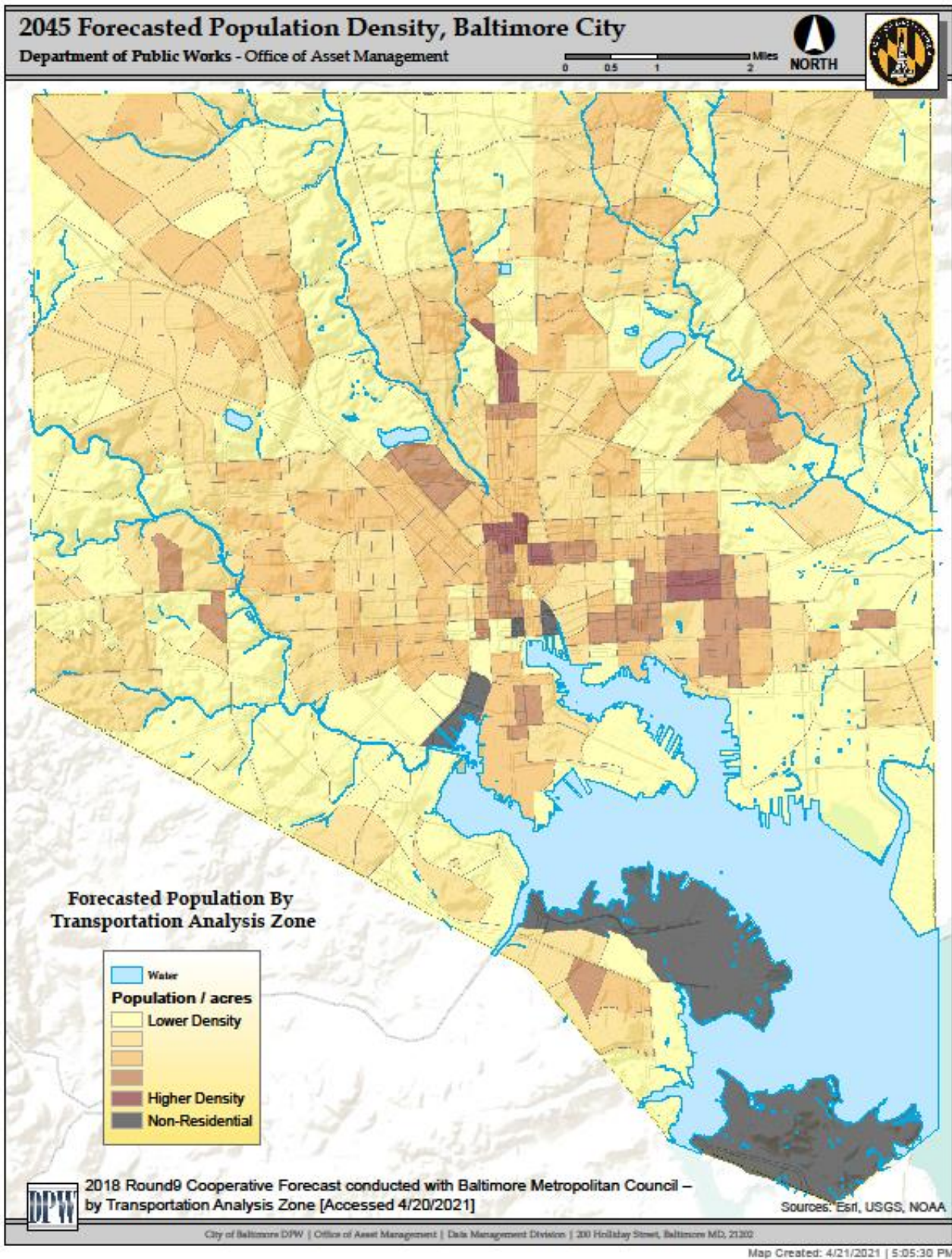


FIGURE 2-16: POPULATION DENSITY 2045





## 2.4 LAND USE

The City has a wide range of land usage. The existing land use patterns are presented in Figure 2-17. In Figure 2-18, the City's current land zoning distribution is shown. Table 2-3 summarizes the zoned land by Acres.

Land use within the City is densely developed and typical of urban areas. Land use is implemented through the citywide zoning code, localized urban renewal plans, and planned unit developments. Uses range from heavy industrial zones to commercial to single family residential. The significant trend affecting land use in the last decade was a steady increase in investment activity leading to infill development, redevelopment, and conversion from industrial to other uses. This development was initially prevalent in waterfront areas and presently continues. More recently, development activity is occurring near transportation nodes and where larger tracts of land are available city-wide. Prior to this reinvestment activity, population loss and a shift to a service economy were the major trends affecting land use in Baltimore. The population losses of the 60s, 70s, 80s, 90s and continuing through 2010 has led to vacant housing and disinvestment. The revised 2010 U.S. Census estimate showed, however, that these losses have significantly slowed, and population is leveling out. At the same time, industrial uses declined. The combination of investment in waterfront areas and the shift to a service economy has led to several conversions of land use. For example, in the immediate waterfront area, a maritime industrial overlay zone was enacted in 2004 to balance the demand for deep water frontage properties for port related uses with the demand for mixed use developments in industrially zoned areas.

In Baltimore overall, it can be said that land use is relatively stable although types of uses are changing. As is described in subsequent sections, the water and sewer needs are to adequately serve new development via updating the existing infrastructure, as opposed to additional new infrastructure. Due to the City's core population losses from its peak of nearly one million, new infrastructure is not required to meet the future needs of these redevelopment areas, only rehabilitation of the existing systems. A map showing existing and proposed major public institutions and government complexes is presented in Figure 2-19.

Zoning	Acres	Area %
Bio-Science Campus	49.68	0.09%
Commercial	4,073.22	7.44%
Educational Campus	1,234.44	2.26%
Hospital Campus	604.47	1.10%
Industrial	6,867.72	12.55%
Industrial Mixed-Use	526.87	0.96%
Maritime Industrial	5,322.97	9.73%
Office-Industrial Campus	623.33	1.14%
Office-Residential	616.54	1.13%
Open Space	6,992.88	12.78%
Port Covington	350.80	0.64%
Residential	26,767.66	48.91%
Transit-Oriented Development	695.84	1.27%
<b>Total</b>	<b>54,726.43</b>	

TABLE 2-3: ZONED LAND IN ACRES

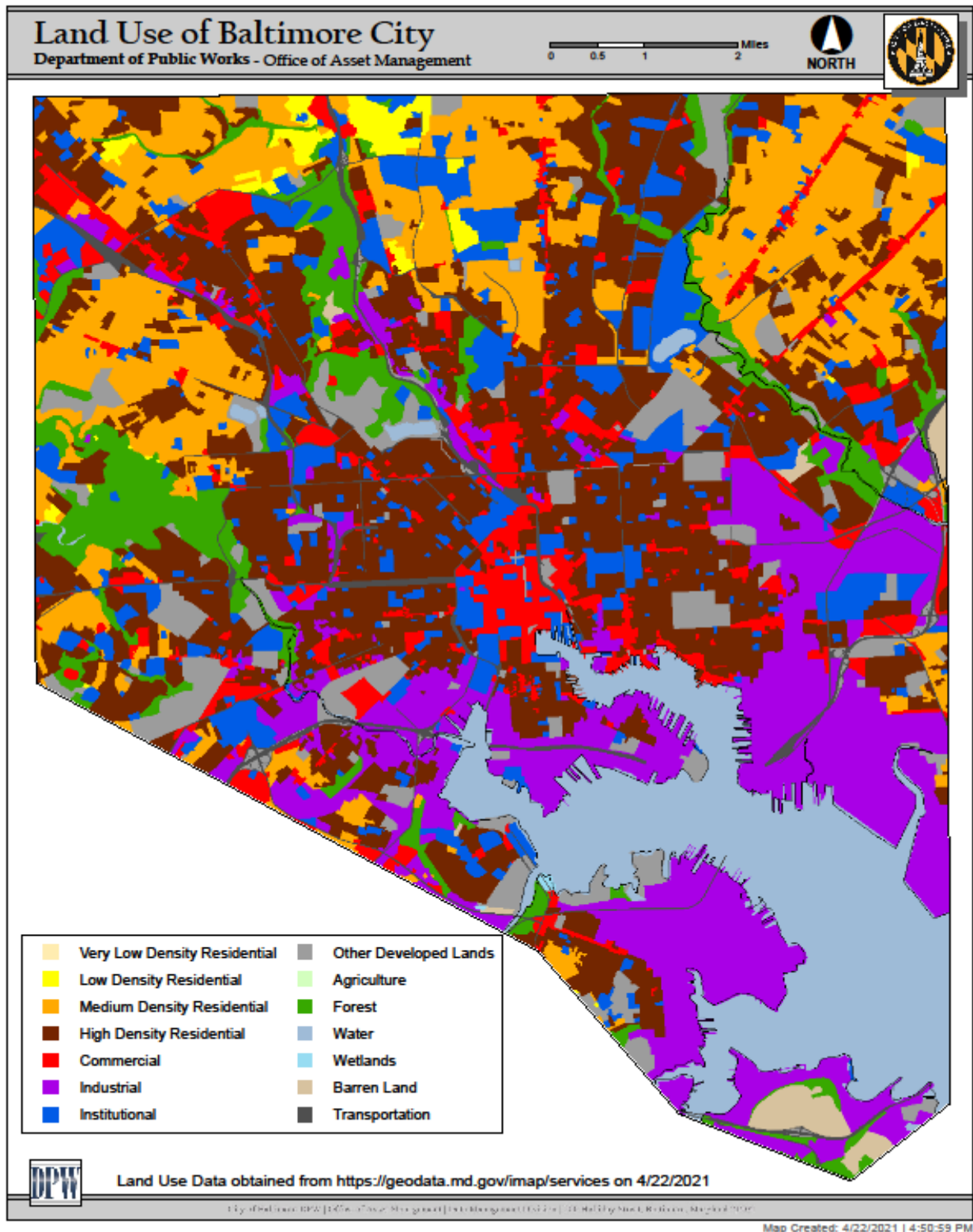


FIGURE 2-17: EXISTING LAND USE



## Baltimore City Zoning Districts

Department of Public Works - Office of Asset Management

0 0.5 1 2 Miles

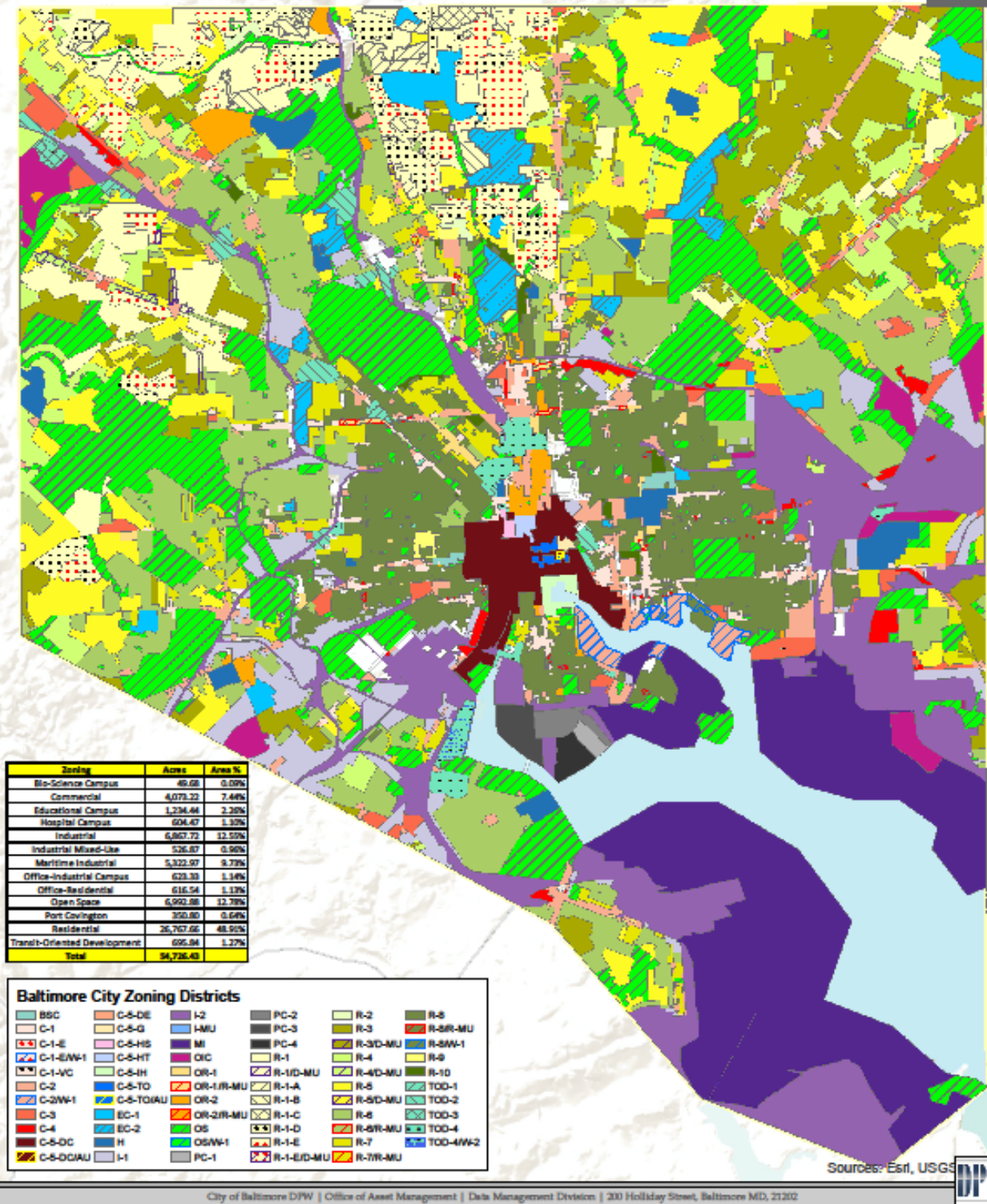


FIGURE 2-18: ZONING DISTRIBUTION



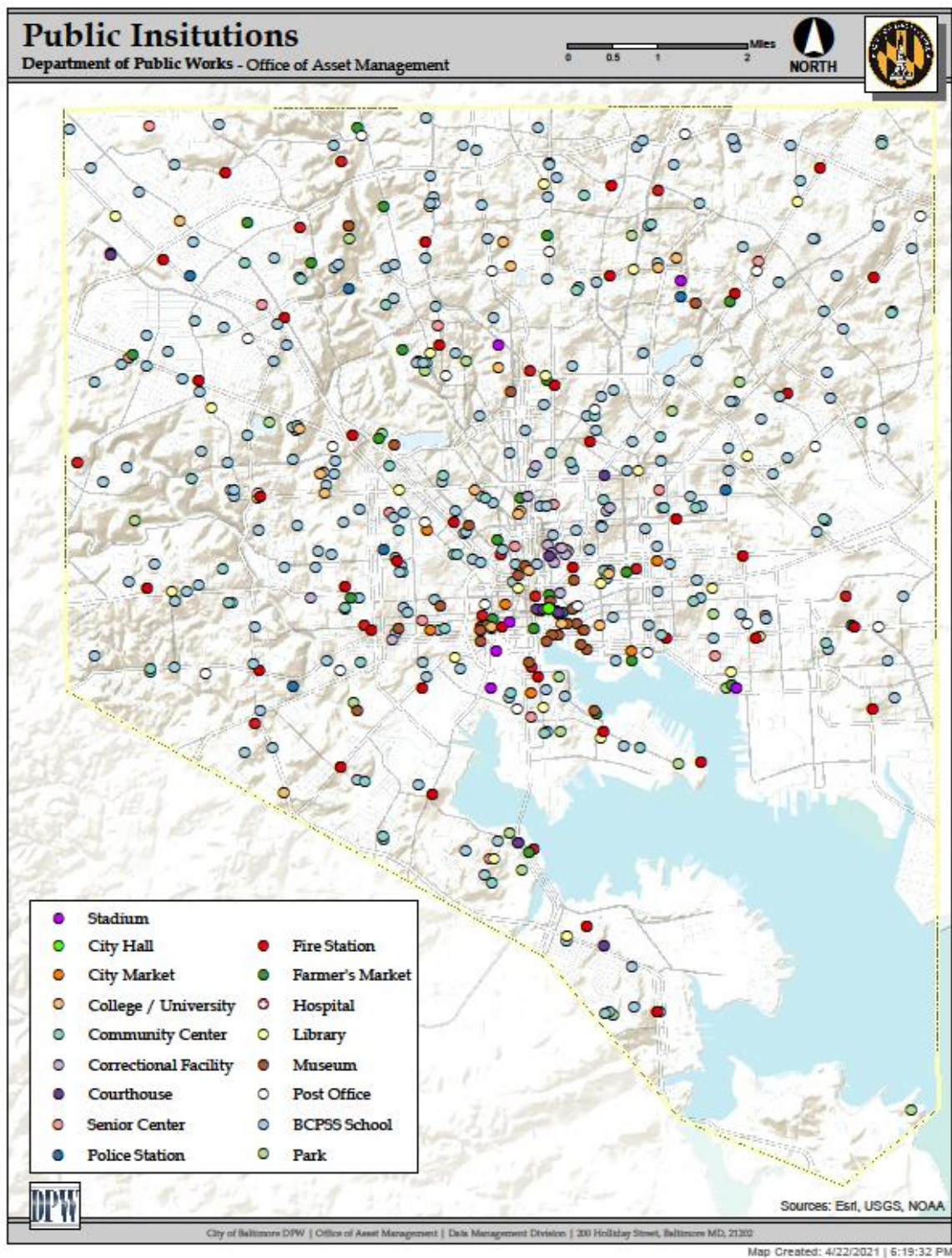


FIGURE 2-19: BALTIMORE CITY PUBLIC INSTITUTION – SCHOOLS, HOSPITALS & GOVERNMENT FACILITIES



## **2.5 SUMMARIES OF OTHER COUNTY WATER AND WASTEWATER PLANS**

The County Water and Wastewater Plans for Baltimore, Howard, Anne Arundel, Carroll, and Harford Counties are included in this CITY PLAN in Appendix A as Exhibit F.

### **2.5.1 BALTIMORE COUNTY**

Baltimore County's most recent release of the County triennial 2017 Draft report for Water and Wastewater was approved by MDE on July 27, 2018.

Population and land use trends continue to change in the County. The estimated population is expected to grow by 9% from 830,918 in 2015 to 905,979 in 2045. This estimate is provided by Baltimore County Department of Planning. The County's 640 square miles that nearly surround Baltimore City have changed from rural into an urban-rural mix over the years. Approximately 90% of the population lives within the URDL line where public water and wastewater services are available, and the other 10% reside in rural areas outside the URDL. The growth areas of White Marsh and Owings Mills were established in 1979 as an effort to address Smart Growth. These areas function as town centers containing a wide mix of residential and commercial growth management. The planning and zoning processes in the County assure continued monitoring of growth compatible with existing and proposed water and sewer facilities.

Baltimore County receives all of its public water from the City's water system. Raw water sources that supply the system emanate from the three water reservoirs, Liberty, Loch Raven, and Prettyboy, located in the County, and from the Susquehanna River. In fiscal year 2019, the County used about 79 MGD from the Baltimore system. This amounts to about 39.76% of the average day water demand of 198.7 MGD. About 45% of the 79 MGD is used by commerce and industry. Residential consumption accounts for the remaining 55%. Legal, financial and practical arrangements for the operation and maintenance of the County water system are defined by agreements between the jurisdictions of Baltimore County and Baltimore City. The County builds and finances improvements that serve the County only; the City maintains and operates the County's system. The County participates in funding projects that benefit the County as well. Cost participation is based on a percentage of the project cost as determined by the percent of benefit to the County. The URDL and BCMD limit expansion of the water system in the County. These boundaries were established with the knowledge that the water system is adequate to serve this entire area.

The County constructs, operates and maintains all sewage collection and pumping facilities within the County. There are 2,200 miles of sewers and 120 pumping stations in twenty-three (23) sewersheds broken down into eighty (80) sub-sewersheds. County generated sewage is treated and disposed of at the City owned and operated Back River and Patapsco WWTPs. The County pays a share of upgrading the City's major facilities, as well as maintenance and operational costs, based on the percentage of total flow conveyed from the County & the City to the City's treatment plants. In 2019, the total flow to Back River WWTP was 174.7 MGD, which is within the planned capacity of 180.0 MGD. The County contributes approximately 52.26% of the sewage flow to Back River WWTP. At the Patapsco WWTP adequate capacity is also available for County flows; with a permitted capacity of 73.0 MGD. The County contributes approximately 50.03% of the sewage flow to the Patapsco WWTP.

On September 20, 2005, Baltimore County entered into a Consent Decree with the U.S. Department of Justice, the U.S. Environmental Protection Agency and the Maryland Department of the Environment. This document requires the County to completely evaluate its sewer system and make corrections in



order to eliminate sanitary overflows in the collection system. This massive effort will involve field investigations, studies, reports, designs and construction projects. As of September 29, 2016 MDE and the EPA approved all Sewershed Repair, Replacement and Rehabilitation (SRRR) Plans. The County is implementing the corrective actions from these plans.

### **2.5.2 ANNE ARUNDEL COUNTY**

The Anne Arundel County Master Plan for Water Supply and Sewerage Systems 2017 Update, reflects the policies of Anne Arundel County's 2009 General Development Plan and the efforts of the community Small Area Plans. Anne Arundel County's plan enables them to fully utilize their groundwater resources and reduce reliance on the City's water supply. Only a relatively small area of Anne Arundel County's wastewater conveyance system discharges to the City's Patapsco Wastewater Treatment Plant (WWTP). The plan shows that current water and wastewater facilities owned and operated by the City are adequate to meet the forecasted interim and long-term demands of Anne Arundel County.

The population based on the 2010 census was 537,656 persons and is expected to grow by 17% to 622,250 persons in 2040. Historically, Anne Arundel County has one of the highest increases in the number of people in Maryland, although the rate of population growth overall has been declining since 1970. Anne Arundel County's existing land use represents "a variety of development types, ages, qualities and conditions, and also demonstrates the close inter-relationship between living places and working places, between land use and transportation." Most of the residential development growth is near the principal urban centers such as Baltimore and Glen Burnie, as well as the BWI, Piney Orchard, Odenton, and Maryland City corridors.

Anne Arundel County is still striving to reduce reliance on water supply that is currently purchased from the City. Existing agreements give Anne Arundel County the right to purchase up to 32.5 MGD. However, in 2015, Anne Arundel County only used 3 MGD (max day) and 0.8 MGD (average day) of water from the City, not fully utilizing the authorized City's supply. Anne Arundel County's estimated future well potential is an additional 66.9 MGD (not including those wells in rural service areas). Therefore, a total capacity of 108.5 MGD is considered readily feasible in the future.

Approximately 18,000 acres of the Baltimore City Wastewater Service Area (WSA) in Anne Arundel County discharges sanitary sewer flows to the Patapsco WWTP. Through an agreement with the City, Anne Arundel County is allotted an average daily flow of 6.39 MGD. Current daily flow in this WSA is 4.37 MGD in 2015 and future total capacity required is estimated as 6.68 MGD for 2040; while there is no immediate concern regarding additional capacity requirements in this WSA, the County must have a plan in place by 2035 to either obtain more flow allocation from the City or to divert from this WSA. Anne Arundel County has also joined with Howard County to study alternatives for providing future treatment capacity for this area separate from the City's treatment plant if necessary.

### **2.5.3 HOWARD COUNTY**

Howard County is a small county that has established land use patterns to assure balanced growth. The general plan does not recommend major changes to land use designations and reinforces limits of the planned growth boundary. The boundary encourages more compact development patterns in eastern Howard County, allowing more efficient provision of public services and facilities. Water and Wastewater facilities connected to the City's systems are adequate to serve Howard County. Most of the development is limited to the eastern portion of the County by a growth boundary. The western part of the County remains rural and is not served by public water and wastewater systems.





The County obtains most of its water supply from Baltimore City, up to 59.3 MGD, and up to 3.5 MGD from the Washington Suburban Sanitary System (WSSC). Both numbers are the daily maximum allowed under the current agreements. The current agreements with the City obligate Howard County to limit its water usage to certain amounts from each zone. The County uses water from both the Second and Western Third Zones. These agreements also require the County to pay for any major facility improvements to the City's water system which are constructed solely for the benefit of Howard County. Four meters measure the volume of water taken by the County and the City is reimbursed according to fixed rates. The County's average usage for 2019 was 26.3 MGD, supplied through the public system.

The majority of the wastewater collection system in Howard County is discharged to the Little Patuxent Treatment Plant, owned and maintained by Howard County. A very small diversion sends sewage to the Patapsco WWTP in Baltimore City. Agreements in place between Howard County and Baltimore City state that the County is allowed to send 10.4 MGD to the City's treatment facility. The 2015 flows from the County amounted to only 7.5 MGD. Projections for the year 2035 anticipate that an allocation of 10.3 MGD will be needed to meet growth demands; therefore, the current agreement in place will be adequate. According to agreements Howard County pays the City through Baltimore County for the volumetric flow sent to the treatment plant.

## **2.5.4 CARROLL COUNTY**

Carroll County is located in central Maryland, and it is approximately west and northwest of Baltimore City. It extends northerly to the Pennsylvania line, and it borders on Baltimore, Howard and Frederick Counties. A ridgeline running in the northeast-southwest direction drains northwesterly toward the Monocacy River and southeasterly toward the Gunpowder and Patapsco Rivers. Carroll County is the smallest of the six jurisdictions by population in the Baltimore Regional Planning Area, comprised of Baltimore City, and the counties of Anne Arundel, Baltimore, Harford and Howard. However, due to Liberty Reservoir being an important water source for the Baltimore metropolitan water system, it is in a significant, environmentally sensitive area. Carroll County is predominately rural with 26% of the population living in eight (8) incorporated towns on only 4% of the land area. Population has been increasing steadily since 1960. Census figures showed increases of 30.7% in 1970, 39.6% in 1980, 28.0% in 1990, 22.3% in 2000, and 11.7% in 2010.

All eight of the incorporated towns in Carroll County are served by community owned water and wastewater systems. Approximately 42% of the population is connected to publicly owned community water systems and 39% to publicly owned community sewerage systems. There are no large privately owned community water or sewerage systems. Publicly and privately owned individual wells and sewage disposal systems are located throughout the County in areas not served by community systems. Carroll County is predominantly rural in character with 71% of unincorporated land area zoned agricultural and 15% zoned conservation, leaving only 11% zoned residential and 2% zoned commercial or industrial. Water Resource Management Areas for existing and future water supplies have been identified and provide guidance for protective measures. Carroll County's watershed management approach is consistent with requirements of the Clean Water Act and the Reservoir Watershed Agreement in which the County also participates.

The quality of groundwater for the County's drinking water source is generally excellent. An active program of groundwater development for Community Planning Areas (CPA) has been followed. Water for the Sykesville-Freedom area is drawn directly from the Liberty Reservoir, for which the quantity is regulated by an agreement with Baltimore City. The agreement permits an average withdrawal rate of 2.4 MGD and the County shall not exceed a maximum rate of 90 million gallons over a 30-day period.



Carroll County and Baltimore City entered into a lease and agreement signed February 16, 2005 by the City Board of Estimates for a 15-year nominal lease of 1.6 acres in the Liberty Watershed adjacent to the Freedom Water Treatment Plant. The County has indicated that this 1.6-acre increase will allow for the expansion of the plant to serve existing residents in the Freedom District. The new agreement allows the County to draw an annual average daily flow of 4.2 MGD or a maximum flow of 180 MGD over any 30-day period from the Liberty Reservoir. Carroll County also recently joined in the reaffirmation of the Reservoir Watershed Management Agreement, which resolved differences between Carroll County and neighboring jurisdictions regarding watershed protection.

The 2019 Carroll County Master Plan for Water & Sewerage (Adopted by the Board of County Commissioners, February 21, 2019, describes plans to provide adequate wastewater facilities to the eight incorporated towns in conformity with identified service areas. The various municipal wastewater systems are regulated by the State of Maryland requirements for private systems. Records and reports must be sent to the State regularly for monitoring to ensure that the health, welfare and safety of consumers are protected. Connections to a community wastewater system are controlled by Carroll County relative to established wastewater service areas.

### **2.5.5 HARFORD COUNTY**

The 2011 Harford County Water and Sewer Master Plan maintains the concept of a planned development corridor, namely the Development Envelope, that was presented in earlier land use plans. It is the focal point of the County's growth management program, which ensures that planned development is located in suitable areas that can be provided with adequate public facilities. Systems operated by Harford County, the cities of Aberdeen and Havre de Grace, the Maryland-American Water Company, Aberdeen Proving Ground, and several smaller water systems provide the water and sewer systems within the Development Envelope.

From the 2011 Harford County Water and Sewer Master Plan. Table 2-1, the projected 2025 population is expected to be 264,850 people. The population in Harford County in 2000 was 218,590 and it reached 244,826 by 2010, an increase of 12.0%. The increase in population is anticipated in the Development Envelope and will be served by public water and wastewater systems. There is adequate existing and planned capacity in the water and wastewater facilities in Harford County to serve the needs of estimated growth to beyond 2010.

The source of the County's potable water is a combination of surface water and groundwater. Surface water is taken from the Susquehanna River for treatment at the Havre de Grace Treatment Plant and from groundwater for treatment at the Perryman Treatment Plant. The Abingdon Treatment Plant was originally designed to take raw water from the City's Deer Creek Pumping Station which pulls water from the Susquehanna River at the Conowingo Dam, but because of complexities in the system operation, this plant has been receiving raw water from the City's Loch Raven Reservoir for the past 12 years. The Deer Creek pumping station can supply raw water to the Abingdon Treatment Plant that has a design capacity of 10 MGD. This plant provides approximately 60% of the daily water supply to the Harford County water system. Harford County has agreements with Havre de Grace and Baltimore City for allocations and funding. In accordance with the February 3, 1993 agreement between Baltimore City and Harford County, the City agrees to sell to the County 20 MGD of raw water in any 24-hour period to supply the Abingdon Treatment Plant. The County has the option to purchase an additional 10 MGD (to total 30 MGD) from the City if the City judges that it can supply the additional 10 MGD without materially affecting its ability to supply its other users.

It is estimated that approximately 72% (117,000) of the total existing population is presently served by the County central wastewater facilities and by municipal or privately owned systems.



## **CHAPTER 3 – WATER SUPPLY AND DISTRIBUTION**

### **3.1 INTRODUCTION**

The City of Baltimore has the primary responsibility of providing water service to the Baltimore Metropolitan area. Chapter 539 of the Legislative Acts of 1924, known as the Metropolitan District Act, requires Baltimore City to furnish water to the Metropolitan District of Baltimore County at cost. Portions of Anne Arundel and Howard Counties are served by request and formalized in a series of agreements that are described in Appendix A as Exhibit E. The City also provides raw water to Harford and Carroll Counties from its reservoirs. The City is experiencing urban expansion in the surrounding county areas while the city itself is essentially fully developed. Future development outside of the City's boundaries is where increases in water demand are anticipated. In order to meet anticipated environmental regulations and meet increasing demands for water, the City is continuously engaged in the planning and development of improvements to maintain the system in sound physical condition. A list of the Capital Improvement Projects (CIP) for the City's water system totaling over \$0.67 billion for the years 2022 through 2027 are provided in Appendix A, Exhibit A. Descriptions of the water related projects can be found throughout this chapter.

### **3.2 THE BALTIMORE WATER DISTRIBUTION SYSTEM**

The Baltimore Water Distribution system, also known as the Central System, functions as the common water system for the City of Baltimore and the Baltimore County Metropolitan District. The Central System also serves as a source of supply of filtered water for consecutive distribution systems in Anne Arundel and Howard Counties. The City's reservoirs are a source of raw water supply for Carroll County and Harford County only.

The Baltimore Central System delivers filtered water to an estimated 1.8 million consumers within a service area of approximately 506 square miles. During Fiscal Year 2019 the Baltimore Central System supplied an annual average 198.57 MGD of filtered water to the Baltimore metropolitan area including Anne Arundel and Howard Counties. The City of Baltimore has an area of approximately 92 square miles and a population of approximately 616,300 (see table 2.2). The Fiscal Year 2019 annual average water supplied to the City was 93 MGD. To date, all areas of the City are being served or have the capacity to be served with existing facilities.

Baltimore City is responsible for the development, operation, and maintenance of the major distribution facilities in the system. The raw water supplies located on the Gunpowder, Patapsco, and Susquehanna Rivers, treatment facilities at Montebello and Ashburton, as well as all distribution facilities located within the boundaries of the City, are owned and operated by the City. Facilities located in neighboring Baltimore County are generally built by the County but are operated and maintained by the City. At one time, Baltimore City owned and maintained a portion of the water distribution system in the Brooklyn Park area of Anne Arundel County. Ownership and maintenance of this system was transferred to Anne Arundel County and is currently a part of the Glen Burnie water system. Howard County owns and operates the distribution system within its boundaries.

### **3.3 SERVICE AREA BOUNDARY (URDL)**

The present service area of the Baltimore Central System, illustrated in Figure 3-1, encompasses all of the jurisdictional area of Baltimore City and a major portion of the County. Not shown in this figure are the areas within Howard County and Anne Arundel County that are also serviced by the Central System on a wholesale account basis, nor the areas within Harford and Carroll Counties which are supplied raw water. Predicting



future service area expansions is an important planning step in determining future water system requirements.

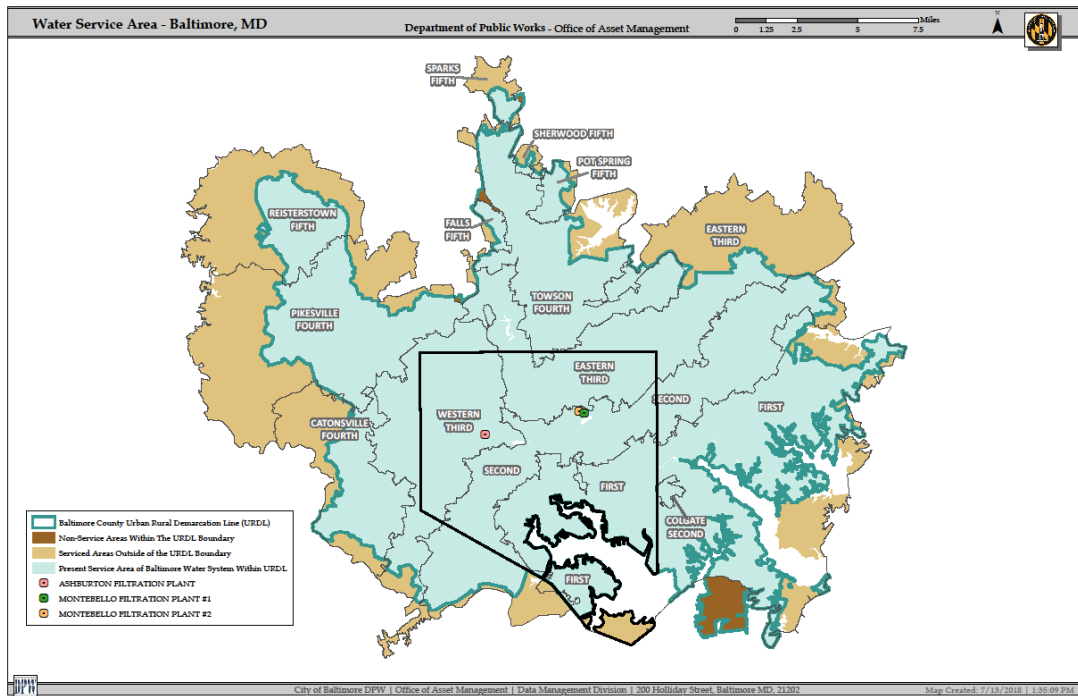
Water agreements have established several boundaries to define the ultimate limits of the area to be served by the City. These boundaries are shown on Figure 3-1. In a report dated December 15, 1953 by the Board of Advisory Engineers (Report on Future Sources of Water Supply and Appurtenant Problems), an ultimate service boundary was established that encompassed an area of 709 square miles. By comparison, the area that is presently served by the Central System today is only 499.5 square miles, which includes 96.0 square miles and 112.4 square miles for the service areas of Anne Arundel County and Howard County, respectively.

The City is required by statute to furnish water to the Baltimore County Metropolitan District (BCMD) under a 1924 Legislative Act by the Maryland General Assembly. The boundary line used to define the limits of the BCMD extends, in certain portions, beyond another boundary the County established decades ago as a deterrent to development called the Urban-Rural Demarcation Line (URDL). Present County zoning limits proposed water service to only that area contained within the BCMD. Despite a few minor areas as shown on Figure 3-1 where water service access has already been extended by state law with approval by Baltimore City and Baltimore County beyond the BCMD into the URDL, the County has been successful in limiting water service to within the intended growth boundary. Figure 3-1 shows those areas that remain to be provided public water service within the BCMD as well as those areas presently to be serviced within the URDL.

The incongruity between the BCMD line and the URDL could represent a significant issue in establishing future service if the state law is ever enforced to extend water and wastewater service beyond the BCMD line. The Baltimore County Water Analyzer Office has indicated that there are no plans, current or future, to extend water service beyond the BCMD. The development of future projected demands, therefore, reflects only that area within the BCMD plus any areas where water service has already been provided outside the URDL. Future projected demands and the timing of additional capital facilities and capacity of development is dependent on the County's ability to control growth beyond present URDL limits which they have successfully accomplished so far, in most areas.

Presented in Table 3-1 are the existing and ultimate areas of service in Baltimore City and County for each of the thirteen pressure zones. The area which the City occupies currently is fully serviced and has no possibility for expansion within its borders. Baltimore County is expected to experience all the future growth for the system. Overall, the service area of the Central System is only expected to grow 4.0 percent until it reaches the limits of the defined service boundary (URDL).





**FIGURE 3-1: BALTIMORE WATER SYSTEM SERVICE AREA**

	Zone	Existing (sq mi)	Ultimate (sq mi)	Growth
Baltimore City	First	27.23	27.23	0.0%
	Second	51.00	51.00	0.0%
	Colgate Second	0.86	0.86	0.0%
	Eastern Third	36.00	36.00	0.0%
	Western Third	36.00	36.00	0.0%
	Towson Fourth	0.33	0.33	0.0%
	<b>City Total</b>	<b>81.50</b>	<b>81.50</b>	<b>0.0%</b>
Baltimore County	First	55.26	58.03	4.8%
	Second	29.74	29.82	0.3%
	Colgate Second	0.86	0.86	0.0%
	Eastern Third	21.34	22.68	5.9%
	Western Third	17.23	18.56	7.2%
	Catonsville Fourth	15.26	15.37	0.7%
	Pikesville Fourth	26.29	28.01	6.1%
	Towson Fourth	28.20	30.09	6.3%
	Falls Fifth	1.39	1.86	25.3%
	Pot Springs Fifth	3.09	3.09	0.0%
	Reisterstown Fifth	9.70	11.02	12.0%
	Sherwood Fifth	0.29	0.54	46.3%
	Sparks Fifth	0.97	1.30	25.4%
<b>Baltimore County Total</b>		<b>209.62</b>	<b>221.23</b>	<b>5.2%</b>
<b>Overall Total</b>		<b>291.12</b>	<b>302.73</b>	<b>3.8%</b>

**TABLE 3-1: EXISTING AND ULTIMATE SERVICE AREAS BY PRESSURE ZONE**



### 3.4 ZONES OF SERVICE AND DEMANDS

The Central System is divided into 13 pressure zones and five major areas of service. Each zone is designed to meet limiting ground elevations in a particular area of the Central System. Ground elevations range from sea level to 752 feet. Baltimore City lies in the First Zone, the Second Zone, the Colgate Second Zone, the Eastern Third Zone, the Western Third Zone, and the Towson Fourth Zone. Elevations served in the City range from sea level to 460 feet.

Table 3-2 lists the estimated populations served and treated water supplied by jurisdiction for the Fiscal Year 2019. Table 3-3 lists the projected water supply demands for the years 2025, 2030, 2035, 2040, and 2045, broken down by jurisdiction. The population projections contained in these tables are as presented in the respective county Water and Sewer Master Plans.

JURISDICTION	EST. POPULATION SERVED	WATER SUPPLIED (MGD)
Anne Arundel County	579,234	0.00
Baltimore City	593,490	93
Baltimore County	827,370	79.21
Howard County	168,447	26.29
TOTAL COUNTIES	924,374	105.5
GRAND TOTAL	1,589,307	198.5

**TABLE 3-2: ESTIMATE OF POPULATION SUPPLIED WITH CITY TREATED WATER AND WATER SUPPLIED AS OF FISCAL YEAR 2019**



Serve Area	2010 Census & FY 2010 Flow			FY 2019 Flow & Population			2020 Flow & Population Projections			2025 Flow & Population Projections			2030 Flow & Population Projections			2035 Flow & Population Projections			2040 Flow & Population Projections		
	Population	GPCD	Demand (MGD)	Population	GPCD	Demand (MGD)	Population	GPCD	Demand (MGD)	Population	GPCD	Demand (MGD)	Population	GPCD	Demand (MGD)	Population	GPCD	Demand (MGD)	Population	GPCD	Demand (MGD)
City of Baltimore **	620,961	149.25	92.68	609,841	152.73	93.14	616,300	150	92.45	618,300	150	92.75	625,100	150	93.77	627,300	150	94.1	643,400	150	96.51
Anne Arundel County *	9,386	303.64	2.85	13,600	—	—	14,100	425.53	6	18,500	405.41	7.5	20,000	410	8.2	20,500	407.8	8.36	21,500	395.35	8.5
Baltimore County *	731,700	126.09	92.26	736,850	107.57	79.26	742,000	133.23	98.86	756,000	135.73	102.61	769,000	138.19	106.27	782,000	140.66	110	791,000	142.47	112.69
Howard County Total *	166,067	150	24.91	172,000	152.91	26.3	174,800	136.73	23.9	176,667	143.21	25.3	177,067	148.53	26.3	177,200	151.81	26.9	178,600	152.86	27.3
Total	1,528,114	139.19	212.7	1,532,291	129.68	198.7	1,547,200	142.97	221.21	1,569,467	145.37	228.16	1,591,167	147.4	234.54	1,607,000	148.95	239.36	1,634,500	149.89	245.00

**Notes:**

Flows for FY 2010 and FY 2019 are based on Annual City of Baltimore DPW reports.  
Projected Flows (FY 2020 thru FY 2040) include residential, commercial and industrial flows.  
Anne Arundel County FY 2020 thru FY 2040 flows are based on prior projections  
as agreement negotiations continue and recent flows have declined below 1.0 MGD.

Montebello WFP I Daily Capacity	128.00	MGD
Montebello WFP II Daily Capacity	112.00	MGD
Ashburton WFP Daily Capacity	165.00	MGD
Combined Daily Capacity	405.00	MGD

\* County Population & Flow Data Source – County Water & Sewer Plans  
\*\* City of Baltimore Population Source – Maryland Department of Planning (April 2019)

TABLE 3-3: BALTIMORE METROPOLITAN AREA POPULATION DATA AND WATER FLOW PROJECTIONS





### 3.5 WATER SUPPLY SOURCES

Water supplies for the residents of Baltimore City and adjacent service areas are obtained from three sources: the Gunpowder Falls, the north branch of the Patapsco River, and the Susquehanna River. Table 3-4 shows the quantities of raw water usage in Fiscal Year 2019 from those three sources. All three sources are classified as surface supplies and more statistics on the impounded raw water supplies are in Table 3-5. The Central System does not make use of ground water as a source of supply, however, there are some industrial and commercial wells located in the City which are not connected to the public system. The locations of these wells may be obtained from well permit records on file at the Maryland Department of the Environment (MDE).

SOURCE	WITHDRAWN
Gunpowder Falls <sup>1</sup>	161.31 MGD
N. Branch Patapsco River <sup>2</sup>	61.15MGD
Susquehanna River (Conowingo Pool)	0 MGD

**TABLE 3-4: RAW WATER QUANTITIES FISCAL YEAR 2019**

<sup>1</sup> Includes 8.57 MGD supplied to Harford County

<sup>2</sup> Includes 2.29 MGD supplied to Carroll County

Facility	Crest Elev. Above Sea Level (feet)	Spillway Length (feet)	Total Length of Dam (feet)	Height of Crest Above Stream Bed (feet)	Flooded Area of Crest Elev. (acres)	Length of Shoreline at Crest Elev. (miles)	Area of Land Owned (acres)	Date Water First Overflowed Crest	Capacity of Reservoir (billion gallons)	Safe Yield (MGD)	Average Stream Flow (MGD)
Prettyboy Dam (Gunpowder River)	520	448	692.5	130	1,500	46	7,380	9/23/1933	19.6	46	229.2
Loch Raven Dam (Gun Powder River)	240	288	650	82	2,400	50	8,000	5/20/1923	23.7	97	
Liberty Dam (N. Branch Patapsco River)	420	480	704	160	3,100	82	9,200	2/6/1956	43.3	94	122

**TABLE 3-5: INVENTORY OF EXISTING IMPOUNDED SUPPLIES**

Notes: Capacity does not take into account loss of storage due to silt infill. Safe Yield is the maximum continuous rate of withdrawal from a supply source during the most severe anticipated drought conditions



(Source: Hillen Pumping Station and Transmission Main Study, Volume II, September 1993, Rummel Klepper & Kahl, LLP)

### 3.5.1 DESIGN CAPACITIES OF PUMPED SUPPLIES

Conowingo Dam Intake (Susquehanna River)	Existing	250 MGD <sup>1</sup>
	Ultimate	500 MGD
Deer Creek Pumping Station	Existing	240 MGD
	Ultimate	250 MGD

**TABLE 3-6: PUMPED SUPPLIES**

1 - Actual allowable withdrawals are controlled by an agreement between the City of Baltimore and the Susquehanna River Basin Commission (SRBC) Which is 250 MGD and 142 MGD peak with a 30-day average of 84 MGD during Trigger Low Flow Events

### 3.5.2 IMPOUNDED SUPPLIES - GUNPOWDER FALLS & PATAPSCO RIVER

The Gunpowder Falls supply has a watershed above Loch Raven Dam of 333 square miles. Two dams are located on this stream: one at Loch Raven and the other farther upstream near the mouth of Prettyboy Creek. The reservoirs have a total combined capacity of 43 BG. In Fiscal Year 2019, approximately 161 MGD was withdrawn from Loch Raven Reservoir on an average day. The development of the Patapsco River, with a watershed of 164 square miles, consists of the Liberty Dam, near Falls Run on the north branch of the river, and the Liberty Reservoir with a capacity of 43 BG. In Fiscal Year 2019, approximately 61 MGD was withdrawn from Liberty Reservoir on an average day. Figure 3-2 shows each of the City's raw water reservoirs and the limits of their corresponding watersheds.

### 3.5.3 OPERATION OF IMPOUNDED SUPPLIES

Under normal operating conditions, water flows by gravity from the Loch Raven Reservoir to the Montebello Water Filtration Plants (WFP) through the Gunpowder Falls-Montebello Tunnel. The tunnel is concrete lined, 12 feet in diameter, and 7 miles in length.

Prettyboy Dam is only opened when the water level in Loch Raven Reservoir drops a few feet below the crest of the dam. The discharge valves at Prettyboy Dam are then opened to maintain a pool elevation in Loch Raven Reservoir sufficient enough to maintain gravity flow to the Montebello WFP. During severe drought periods when storage levels drop and gravity flow cannot be sustained, water can be pumped from the Loch Raven Reservoir to the Montebello WFP by a low lift pumping station located at the plants. The station, called the Montebello Raw Water Distribution Center, was constructed in 1958 in connection with the Susquehanna Water Supply Project. The station contains three 120 MGD pumps.

Water from Liberty Reservoir flows by gravity through a concrete lined tunnel, 10 feet in diameter, and 12 miles in length to Ashburton WFP. Three low lift pumps at the Ashburton WFP can pump water from the reservoir whenever reservoir levels fall too low for gravity flow.

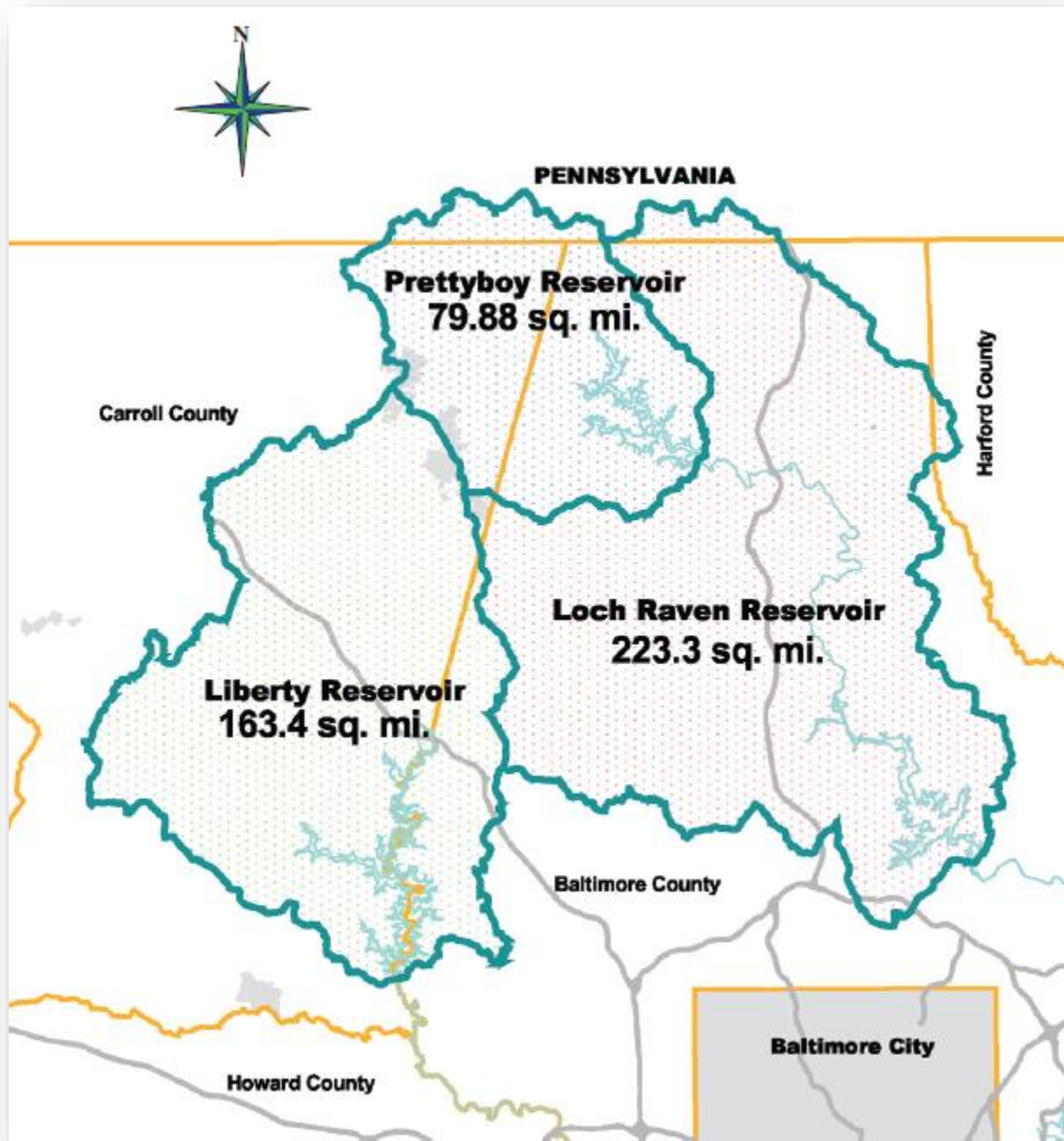


FIGURE 3-2 : BALTIMORE COUNTY WATERSHEDS





### **3.5.4 RESERVOIR IMPROVEMENTS**

The City has completed several improvement projects and studies involving the reservoirs and dams. Improvements at the Loch Raven Dam were undertaken to increase the spillway capacity by raising the non-overflow portion of the dam 28 feet and maintaining the crest at elevation 240 feet. Floodgates 15 feet high were added to the roadway adjacent to the dam to be closed in cases of emergency. In addition, the structural integrity of the dam was reinforced by adding 85 feet of concrete to the base of the dam. The mass of concrete placed amounted to 7,000 cubic feet of conventional concrete and 63,000 cubic feet of roller compacted concrete. The Prettyboy Dam was rehabilitated to include electrical and mechanical improvements as well as site work. New ground maintenance buildings have been constructed at Prettyboy Reservoir. The buildings will provide storage areas for equipment and facilities for maintenance staff.

The Liberty Dam rehabilitation is complete. Evaluations are underway to develop alternative approaches to inspect the condition of the Liberty and Loch Raven water conduits. In addition, the City is developing options for rehabilitation of the Montebello Raw Water Tunnel Dewatering Facility. Current or upcoming projects are listed below:

- Maintenance Building Improvements at Liberty Dam (WC-1207) – Evaluate conditions of the existing maintenance facilities at Liberty Dam and design and construct recommended improvements. (Construction Completed).
- Urgent Need Reservoir Area – Roads & Culvert Repair & Rehabilitation – Rehabilitate & reconstruct roads associated with City-owned watersheds. Rehabilitation/reconstruction to include Phoenix Road, Warren Road, Nicodemus Road, Beckleysville Road, George’s Creek Road, Spook Hill Road, and Loch Raven Drive.
- Watershed Bridge Maintenance – Repair or replace, clean and paint bridges within City-owned watersheds.

### **3.5.5 SUSQUEHANNA PUMPED SUPPLY**

The Susquehanna supply includes the Conowingo intake, the Deer Creek Pumping Station, and connecting tunnels and pipelines. The intake has an ultimate capacity of 500 MGD. The pumping station presently contains Four 62.5 MGD pumps to provide a safe operating capacity of 250 MGD. Raw water flows from the Conowingo intake to the Deer Creek Pumping Station through a 144-inch and 108-inch diameter tunnel. A 108-inch and 96-inch diameters pipeline connects Deer Creek Pumping Station and Montebello WFP. The total length of the Susquehanna Transmission Main is approximately 38.3 miles.

### **3.5.6 OPERATION OF SUSQUEHANNA PUMPED SUPPLY**

All water taken from the Susquehanna River must be pumped since gravity flow is not an option. The amount of raw water that can be taken from the river is limited to 250 MGD during non-trigger flow conditions, and 142 MGD Peak with a 30-day average of 84 MGD during trigger flow conditions as established by an agreement between Baltimore City and the Susquehanna River Basin Commission (SRBC) in 2011. Trigger flows are minimum stream flow limits established by the SRBC.



### **3.5.7 SUSQUEHANNA SUPPLY IMPROVEMENTS**

The City has upgraded the Deer Creek Pumping Station and increased the capacity to meet future needs. The improvements of automation for station operations to effectively control systems and minimize additional staffing are a major enhancement to the function of the Baltimore water system. These improvements are essential to meet the demands of the Baltimore water system in drought conditions when water must flow from the level of the Susquehanna River to be pumped from the Deer Creek Pumping Station and continue by gravity to the Baltimore Metropolitan District.

### **3.5.8 RESERVOIR POLLUTION**

Liberty, Loch Raven, and Prettyboy Reservoirs have experienced water quality problems related to algae blooms for the past several decades. Algae thrive when there is an abundance of nitrogen and phosphorus. All three of the City owned reservoirs experience excessive phosphorus pollution originating from agricultural and urban runoff and to a lesser extent from point sources. The last incidence in the water system related to blue/green algae was experienced in 1981. For more detailed information regarding reservoir pollution and trends in water quality, refer to the Water Quality Assessment of the Reservoirs, November 2004, prepared by the Reservoir Technical Group.

Sedimentation infill is another contributing factor to pollutants in the reservoirs. In the past, the City paid for bathymetric surveys of Loch Raven, Prettyboy and Liberty Reservoirs which were conducted by the Maryland Geological Survey and the U.S. Geological Survey (USGS). These surveys found that significant sediment accumulation have reduced capacity available in each reservoir. Sediment from Loch Raven Reservoir was also analyzed as a part of this project and slightly elevated levels of zinc and lead were found. For more information, refer to the Bathymetric Survey and Sedimentation Analysis of Loch Raven and Prettyboy Reservoirs, 1999.

A Source Water Assessment has also been conducted by the City and MDE for Liberty and Loch Raven Reservoirs. The assessment used source water delineation, contaminant surveys, and susceptibility analysis as its main form of accumulating data. The report documented the potential threats to and susceptibility of the reservoirs to accidental leaks or spills in these watersheds.

Baltimore City Reservoir and Natural Resources Section (RNRS) staff and the Baltimore Metropolitan Council Reservoir Technical Group (RTG) provided input for the development of a Watershed Monitoring Assessment for the Monitoring Program. The report developed by USGS documents and outlines recommendations for what an "ideal and appropriate" water quality monitoring program should be for the Baltimore Metropolitan Reservoir Watersheds. The USGS "Water Quality Monitoring Program for the Baltimore Reservoir System, 1981-2007- Description, Review and Evaluation, and Framework Integration for Enhanced Monitoring" report documents the current monitoring strategy. The core monitoring program must have the appropriate level of QA/QC, analytical needs and special projects related to reservoir management.

Monitoring data collected as part of the RNRS Reservoir Program has been used in TMDL development of Loch Raven and Liberty Reservoirs and the TMDLs will help reduce nutrient and sediment inputs into the drinking water reservoirs. This action will aid in reduction of algal blooms and other factors that increase treatment costs and contribute to taste and odor problems.



### **3.6 RESERVOIR WATERSHED MANAGEMENT PROGRAM**

The Reservoir Watershed Management Program is based on a formal agreement signed in June 1984, but parts of the program can be traced back to the 1970s. The Reservoir Watershed Management Agreement was reaffirmed by the signatory entities in 1990 and again in 2003. In 2003 those entities were: Baltimore City, Baltimore County, Carroll County, Baltimore County Soil Conservation District (SCD), Carroll County SCD, Maryland Department of Agriculture (MDA), Maryland Department of the Environment (MDE), and the Regional Planning Council (predecessor to the Baltimore Metropolitan Council). The signatories were chosen because of their definite roles in or resources they could provide to the overall problem of protecting the City's three reservoirs.

The purpose of the 1984 Agreement was to commit the signatory parties to protecting the three metropolitan water supply reservoirs by preventing any increase in the amount of nutrients, such as phosphorus (P) and Nitrogen (N), and sediment entering the reservoirs, as well as reducing the current level of nutrients to "acceptable" levels. During the 1970s, it was found that all three lakes were accumulating sediments from the tributaries and were experiencing higher levels of nutrient "over-enrichment" resulting in seasonal algal problems. Excessive algae increases treatment costs, causes taste and odor problems, and allows for the formation of in plant Disinfection By-Products (DBPs).

This agreement endorsed the implementation of the Watershed Action Strategy, which sets forth the specific policies, initiatives, and resource commitments that state and local agencies will have to pursue to achieve the goals of the agreement. It serves as the "benchmark" against which progress is measured. Implementation was assigned to a policy board and a technical committee (the Reservoir Watershed Technical Group), which consisted of an employee from each signatory entity. Actual implementation of specific commitments in the Action Strategy is performed by the state and local agencies who work through their planning and zoning programs, regulatory programs, public works departments, and other programs which provide direct assistance to landowners.

At the Baltimore Metropolitan Council (BMC), the Reservoir Watershed Technical Group meets on a monthly basis. The meetings are open to interested citizens along with the representatives from the Maryland Department of Natural Resources and the adjacent counties. The group discusses new issues of concern relating to the reservoirs, reviews local rezoning proposals, reviews changes in local comprehensive water and sewerage plans, shares new watershed-related technical information among the members, and plans/implements cooperative projects which are intended to benefit the reservoir watersheds in keeping with the goals of the agreement.

The City strongly supports employment of effective measures to protect the region's water supply from the adverse impacts of development and other activity and understands "the importance of not overdeveloping the reservoir watersheds as a means of protecting water quality" as stated in the Reservoir Program Technical Report.

### **3.7 FOREST MANAGEMENT**

MDE was retained to prepare a report for Baltimore City assessing the health of the forests in the watersheds contributing to the three reservoirs that supply water to the Baltimore City water system: Liberty, Loch Raven, and Prettyboy. The report was submitted to the City in late 2002, the Comprehensive Forest Conservation





Plan for Long-Term Watershed Protection on the City of Baltimore's Reservoirs. This major study collected 4,000 under story and over story samples on all three watersheds to determine if existing conditions met intensity and density requirements established by US Forest Service criteria. Examples of some issues identified were lack of diversity of forest plants, deer browse pressure, fear of weather effects on mass pine tree areas, and lack of seedlings for forest replenishment. The report concluded that the watersheds are not providing optimal protection to the reservoirs in their present condition. Recommendations for the next 10 years included introducing sylva culture, adding seedlings and deer control measures, and developing forest replenishment with an appropriate mix of trees and shrubs.

MDE prepared The Comprehensive Forest Conservation Plan for Long-Term Watershed Protection on the City of Baltimore's Reservoirs in 2002 which promulgated the establishment of the "Reservoir Watershed Coalition" to engage stakeholders interested in stewardship of the reservoir watersheds to organize activities such as tree planting and trash clean-ups throughout the year. To date this outreach program resulted in the reforestation of over 25 acres of City-owned property within the Loch Raven and Prettyboy Reservoirs and has given the public a voice.

Reservoir and Natural Resources Section (RNRS) and Maryland DNR obtained a grant to fund a Forest Assessment Study for the Loch Raven and Liberty Reservoirs which will focus on forest regeneration by assessing light attenuation from canopy cover, deer browse pressure, and invasive species. Data from the three-year study will be used to develop a forest management strategy to convert aging, failing pine plantations to hardwood forest species.

RNRS worked with the Baltimore County Department of Environmental Protection and Sustainability to open specific, limited areas in Loch Raven Reservoir to bow hunting to aid in reduction of deer browse pressure. The sharpshooting program is performed by volunteers from the hunting community by permit, at no cost to the City. The sharpshooting program was used to augment the RNRS public bow hunting deer management program for Liberty, Loch Raven and Prettyboy Watersheds amounting to an overall harvest for 2015 to 2016 of 4,970 deer. [Maryland Annual Deer Report 2015-2016, Table 1, Maryland Department of Natural Resources Wildlife and Heritage Service.]

RNRS staff worked with Maryland DNR, Forest Service to establish Community Wildfire Protection Plans for the City-owned portions of the Liberty, Prettyboy and Loch Raven watersheds. The Wildfire Protection Plan was a collaborative effort to guide the wildfire protection activities on the Baltimore City reservoir properties. The purpose of the plan was to provide guidance and planning resources to City land managers, emergency personnel and citizens living adjacent to the Baltimore City reservoir watersheds. The program had four main goals:

- Educate homeowners living adjacent to the reservoirs on the facts about wildfire in Maryland and create an awareness of wildfire issues.
- Work collaboratively to implement "Firewise" practices that reduce the risk of wildfire on the reservoir property.
- Reduce fuels hazards on reservoir property to minimize wildfire intensity and increase community safety.
- Improve emergency vehicle access to the forest interior by properly identifying fire roads and improving the condition of the fire roads.



### **3.7.1 FOREST MANAGEMENT PLAN**

Reservoir and Natural Resources Section (RNRS) in conjunction with MD DNR, Fisheries Service, continue to maintain a cold-water release from the Prettyboy Reservoir in support of the tail water fishery for the Gunpowder Falls. The management practice has resulted in the establishment of a "Blue Ribbon" trout fishery in the Gunpowder Falls which is ranked as one of the top 10 in the Country.

RNRS staff participated in the Eastern Brook Trout Joint Venture project with MD DNR Fisheries Service to identify high quality waters in the Prettyboy Reservoir watershed that currently support or have the potential to support a native Brook Trout fishery. The Eastern Brook Trout Joint Venture (EBTJV) is the nation's first pilot project under the National Fish Habitat Initiative, which directs locally driven efforts that build private and public partnerships to improve fish habitat. The long-term goals of the EBTJV are to develop a comprehensive restoration and education strategy to improve aquatic habitat, to raise education awareness, and to raise federal, state and local funds for brook trout conservation. The study found several locations within the Prettyboy watershed which would be strong candidates for the program.

### **3.8 WATER FILTRATION PLANTS**

All community water systems are tasked to produce water that will meet the accepted standards for public consumption. Water treatment facilities may find it necessary to use any or all the following treatments: chemical treatment, chlorination, coagulation, filtration, sedimentation, and fluoridation. Accepted standards require the finished water to be free of all organisms of a pathogenic nature. In addition, there are limitations to the concentration in the finished water of chemical constituents which are considered harmful or otherwise undesirable which fall under the federal Primary or Secondary Standards.

To meet these requirements, guidelines for water quality standards have been outlined by "The Safe Drinking Water Act", passed by Congress in 1974, and last amended in 1996. The bill formally outlines standards for the quality of drinking water and requires the Environmental Protection Agency (EPA) to issue regulations and act as the governing agency in this matter. These primary regulations are listed in the most recent revisions to the Code of Maryland Regulations (COMAR) 26.04.01, Quality of Drinking Water in Maryland. Secondary regulations regarding corrosivity were promulgated by Federal Regulations, Chapter 40 CFR, Section 143, Revised January 30, 1991. These standards represent the minimum requirements to be met by all public water distribution systems unless specifically excluded. The City of Baltimore is in compliance with all regulations and requirements pertaining to the quality of drinking water.

#### **3.8.1 PURIFICATION PLANTS**

Baltimore City owns and operates three water filtration plants: Ashburton WFP, Montebello WFP No. 1 and Montebello WFP No. 2. Table 3-7 lists the existing treatment facilities for the Baltimore water distribution system, including capacities and peak flows. Currently, Montebello WFP No. 1 can treat 128 MGD, Montebello WFP No. 2 can treat 112 MGD, and Ashburton WFP can treat 165 MGD.

The rated capacity of the three existing treatment plants, including improvements to the Montebello plants discussed below, will be 405 MGD. There are plans to construct a fourth treatment plant, the Fullerton Treatment Plant.



	Municipal Montebello Plant No. 1	Municipal Montebello Plant No. 2	Municipal Ashburton Plant
Water Source	Gunpowder and Susquehanna Rivers		Patapsco River
Plant Coordinate Location	917,124 E 547,464 N	915,923 E 547,759 N	895,645 E 542,673 N
Rated Plant Capacity	128 MGD	112 MGD	165 MGD
Average Productions Fiscal Year 2019	74.6 MGD	65.3 MGD	58.7 MGD
Maximum Peak Flow	Total of Plants 1 and 2 > 240 MGD		165 MGD
Usable Storage Capacity	Plants 1 and 2 15.5 MG	Druid Lake 218.5 MG	Lake Ashburton 70.4 MG
Method of Solids Removal	Lagoon/On-Site Treatment	Lagoon/On-Site Treatment	Lagoon
Operating Agency	Baltimore City	Baltimore City	Baltimore City

\* Ultimate disposal of solids: co-disposal with Back River WWTP solids

**TABLE 3-7: INVENTORY OF EXISTING WATER TREATMENT FACILITIES**

The Fullerton Treatment Plant is planned to treat water primarily from the Susquehanna River.

### 3.8.1-1 MONTEBELLO FILTRATION PLANTS NO. 1 AND NO. 2

The Montebello complex comprises two complete plants. Plant I, located on the east side of the 3900 block of Hillen Road, was put into operation in 1915, and has 32 filter units with a design capacity of 128 MGD. Plant II is located on the west side of Hillen Road directly opposite the first plant, has 28 filter units with a design capacity of 112 MGD and was placed in service in 1928. Over the years, both plants have undergone numerous improvements and upgrades to maintain compliance with ever increasingly stringent water quality standards. Current improvements include:

- Montebello WFP 1 Improvements [Construction Phase, WC-1328]
- Montebello WTP I Improvements – Upgrade existing filter controls at Montebello. [Design Phase, WC-1397]
- Structural Rehabilitation of Sedimentation Basins at Montebello WFP 2 [Design Phase, WC 1396]
- Electrical Improvements at Montebello WFP 2 [Design Phase, WC 1408]
- Susquehanna Transmission Main Valve Replacement – Removal and replacement of air release & vacuum release water valves located along the length of the Susquehanna Raw Water Transmission Main from Abington Road to Montebello Water Filtration Plant. [Design Phase, WC-1197]
- Chlorine Handling Safety Improvements – Provide safety improvements by eliminating gaseous chlorine at each of the fifteen chlorination facilities, including both Montebello Plants, and substitution of sodium hypochlorite facilities. [Design Phase, WC-1327]





### **3.8.1-2 ASHBURTON FILTRATION PLANT**

The Ashburton Plant was put into service in 1956 and is located at 3001 Druid Park Drive. This plant has a rated peak capacity of 165 MGD with 20 filter units. There are currently two major projects underway to upgrade this facility by replacing outdated equipment, improving performance and improving safety. Project description is located below:

- Ashburton Low Lift Pumps – Engineering Evaluation at the Ashburton water filtration Plant low lift pumping station. [STUDY PHASE Complete]
- Ashburton Two Tanks [Construction – ongoing]

### **3.8.1-3 FUTURE FULLERTON FILTRATION PLANT**

The future Fullerton Plant is currently on hold. This plant would have a rated capacity of 120 MGD. The plant would be located off of Belair Road in Baltimore County.

### **3.8.1-4 FILTRATION PLANT ANNUAL IMPROVEMENTS**

The Capital Improvements Program provides for the ability to respond to unanticipated needs for design and construction services. Project descriptions from the FY 2021CIP are located below:

- Urgent Needs Water Facilities – Annual Improvements – Repair and maintain water treatment and conveyance facilities as required as a result of unanticipated failures of equipment, operating systems or facilities. [ONGOING]

## **3.9 WATER DISTRIBUTION SYSTEM**

The distribution system consists of a network of mains varying in size from 4-inch to 144-inch in diameter. The majority of these mains are of cast iron, but some of the larger sizes, that is, 16-inches and larger in diameter, are of steel or reinforced concrete. There are approximately 4,500 miles of main in the system, of which 1,550 miles (about 35%) are in Baltimore City. Figure 3-3 contains a distribution system map which illustrates all water mains 12 inches and larger within the City boundaries. The water mains connect a series of pumping stations, reservoirs and elevated storage tanks in five major zones of service.

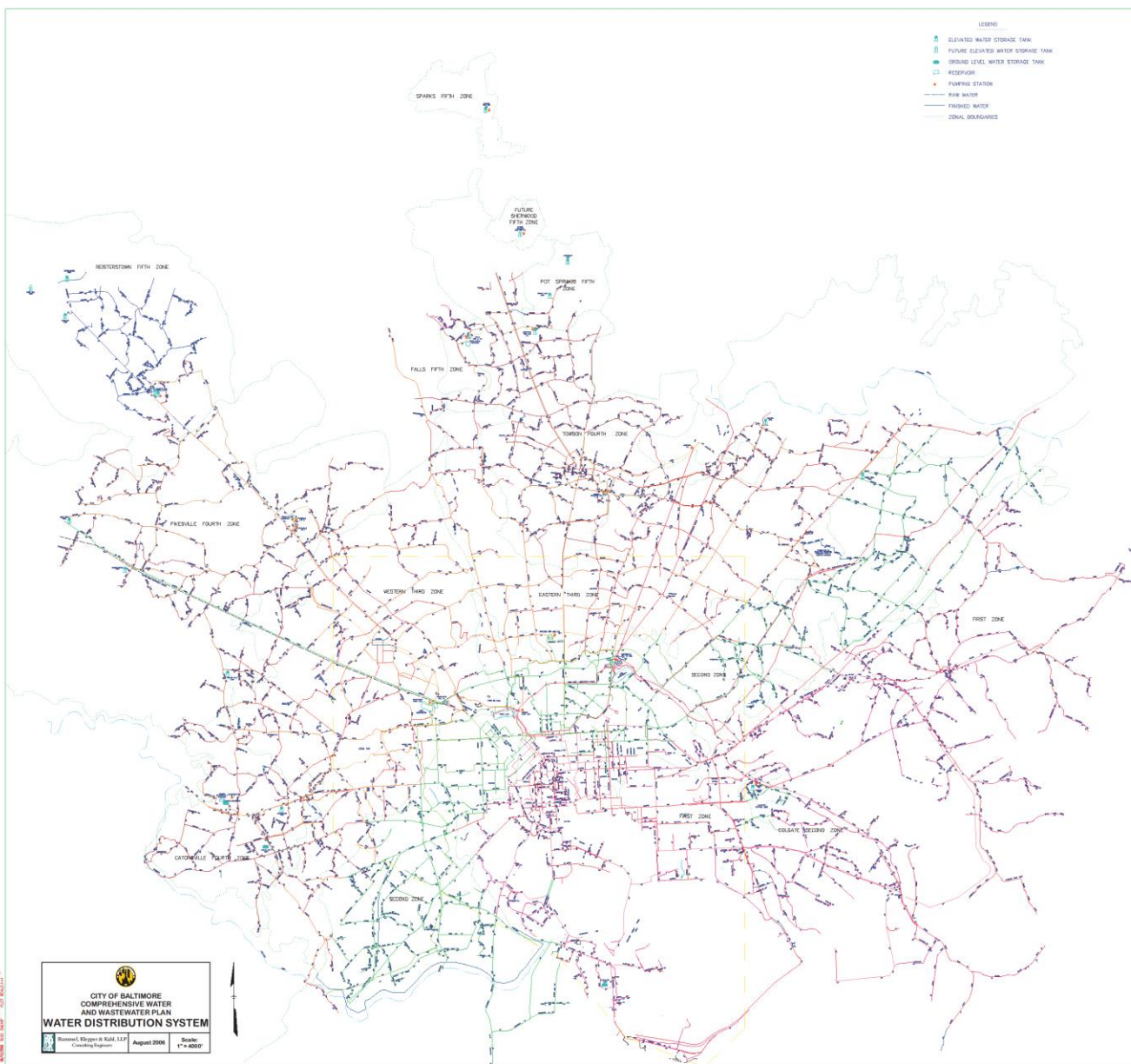
Each zone is designed and maintained to supply water at a minimum 40 pounds per square inch (psi) pressure to the consumers in the area and to provide adequate flow for fire suppression. The City has an extensive cleaning and lining program to rehabilitate older unlined cast-iron mains and to restore their flow capacity to new pipe status. The City also has programs to identify and inspect certain critical large diameter water mains as well as a system-wide hydrant and valve exercising program. Planning and construction of water supply and distribution facilities within the County's boundary is the responsibility of Baltimore County with a statutory right of approval by Baltimore City as per the 1972 Agreement.

It is worth mentioning that all properties inside the Urban Demarcation Line (URDL) are supplied water by City of Baltimore Water Distribution system. Since the entire City of Baltimore lies entirely inside the URDL, there are no wells within the City.

Also, the Baltimore Metropolitan Water System is an aging system that is undergoing numerous rehabilitation projects to repair and maintain and ensure supplying water to meet the current and future demands. Examples of the issues that face the City's operation and maintenance teams are low fire capacity or low



chlorine residuals. However, such issues are not due to major deficiency in the system and are resolved effectively by the City's maintenance crew.



**Figure 3-3: Water Distribution System**

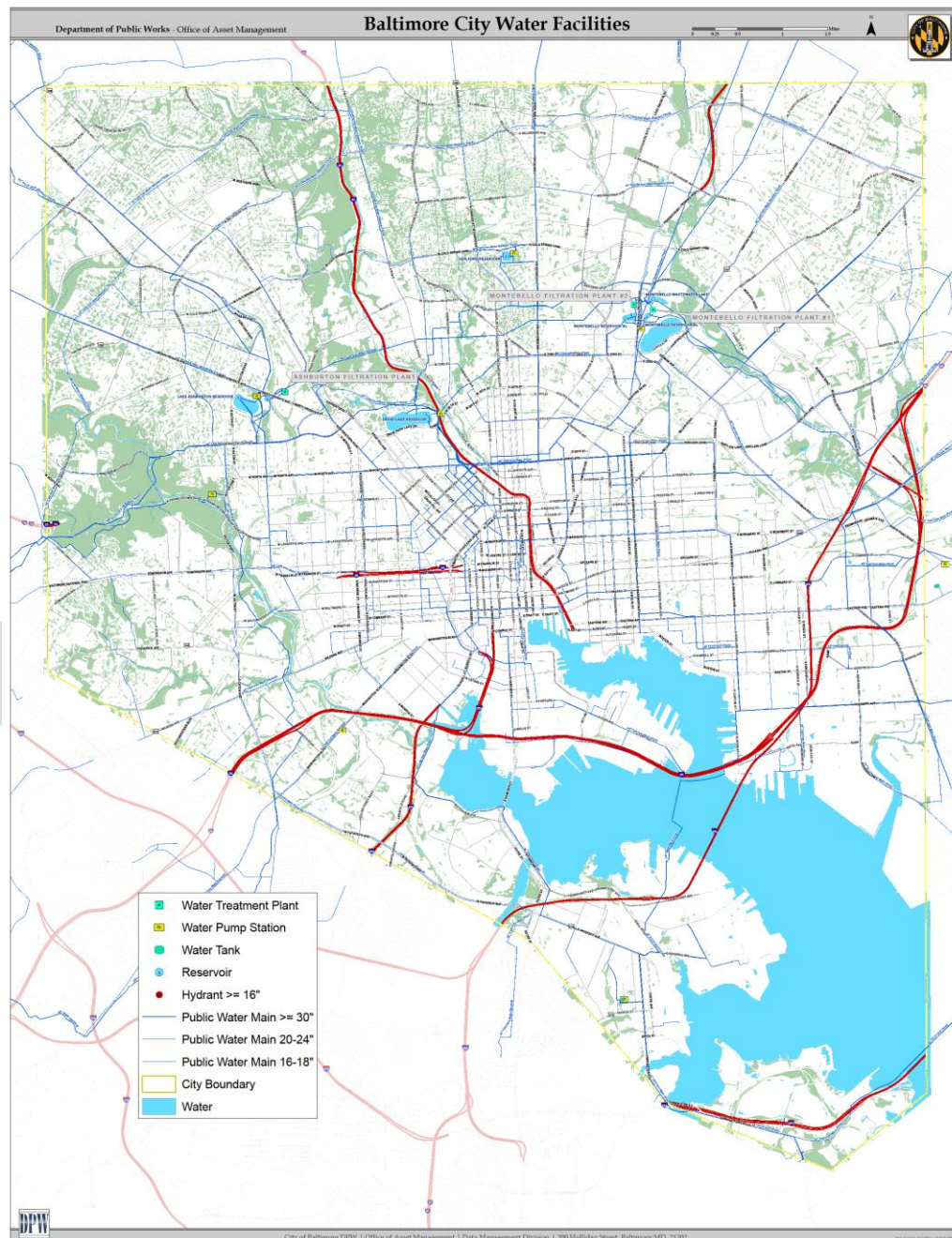
### **3.9.1-1 METHOD OF DISTRIBUTION BY ZONES**

Under the present operating system, the Montebello WFPs supply water to the First Zone by gravity and to the Second and Third Zones by pumping. The Ashburton WFP supplies water to the Second Zone by gravity, and to the Third, Fourth, and Fifth Zones by pumping. Figure 3-3 is a supply schematic diagram of the principal elements of the Baltimore water supply and distribution system. The First and Second Zones contain approximately 46 percent of the land in the distribution system, with consumption in those zones of approximately 48 percent of the filtered water supply. Most of the heavy industry within the Baltimore



Metropolitan region is in the First Zone. The Second Zone supplies water to considerable commercial and light industrial developments. Both the First and the Second Zones also supply water to large residential developments within their limits. The Third, Fourth and Fifth Zones contain the remaining 54 percent of the land in the distribution system, with consumption in those zones comprising approximately 52 percent of the filtered water supply. The consumption in these zones is predominantly residential with some commercial and industrial demands present. A diagram depicting the distribution system and the major treatment/pumping elements is in Appendix B Exhibit A.

Appendix B Exhibit B through Exhibit G contain data used to compile water usages within the Central System Water Pressure Zones for the following sections.



**FIGURE 3-4: WATER SUPPLY DISTRIBUTION MAP**





### **3.9.1-2 FIRST ZONE**

The First Zone of service of the Central System presently serves the tidal areas of Baltimore City, Baltimore County, and the northeastern part of Anne Arundel County. The total land area served by the First Zone is 82 square miles or about 28 percent of the entire water service of the Central System. The elevations that are served range from sea level to about 150 feet. The average annual demand for the zone is 57 MGD.

The First Zone serves an area of 27 square miles in Baltimore City with a population of 174,000. The annual average demand for the City portion of this zone is 44 MGD. The principal industrial areas of the City and the Counties are in this service area. In types of use, water consumption is 33% percent domestic, 42% percent public-commercial and 25% percent industrial. With industry slowly continuing to leave the City and surrounding areas, the industrial percentage is estimated to drop over the next 20 years. With respect to the entire water service area in the City, the First Zone contains a little over one-fourth of the population but uses approximately 48% of the water, because of the large industrial and public-commercial demands. It should be noted that the per capita value in the City is significantly higher (as shown in Table 3-3) than the Baltimore County per capita value, most likely due to this high percentage of industrial demand in the City.

Water is supplied by gravity to the First Zone by the Montebello WFP, which is at an elevation of 215 feet. At the present time, storage facilities in the zone include 32.0 MG usable storage at the filtered water Tanks at Montebello WFP; about 364.5 MG, between the elevations 200 and 214.5 feet, at Druid Lake Water Tanks; and 4 MG at the Curtis Bay Tank overflow elevation 208.96 feet for balancing storage in the area south of the harbor. Water storage at the Fullerton Reservoir (separate from the future Fullerton WFP), currently under construction, will add a proposed 60 MG to the First Zone.

### **3.9.1-3 SECOND ZONE**

The Second Zone is a long narrow area of approximately 51 square miles that extends diagonally across the Baltimore water service area from Brooklyn and St. Denis in the southwest to the vicinity of the County Beltway between Belair Road and Pulaski Highway in the northeast. This zone also supplies water to portions of Anne Arundel and Howard Counties. Approximately 42 percent of the area is in Baltimore City. Ground elevations in the zone range from below 100 feet to 285 feet. The annual average demand for the zone is 30.9 MGD.

In Baltimore City, the Second Zone serves an area of 21 square miles with a population of approximately 229,000. The average annual demand for the City portion of this zone is 18.6 MGD, or 60.1 percent of the total demand in the City. The types of use in the Second Zone are as follows: 68% percent domestic; 29% percent public-commercial; 3% percent industrial. This zone is primarily residential with supporting commercial districts and the distribution of demands is not expected to change considerably.

Water is supplied to the Second Zone by gravity from the Ashburton WFP and is pumped through the zone by the Vernon, Hillen and Fullerton Second Pumping Stations. Vernon Pumping Station takes suction from the Druid Lake water supply in the First Zone. Hillen Pumping Station takes suction from the Montebello Plant 2 Finished Water Tanks and the Fullerton Second Pumping Station currently takes suction from the Fullerton transmission main, both in the First Zone. Storage is provided for the zone by the Guilford Reservoir (Construction started for underground tanks), which has a storage capacity of 13.6 MG, Lake Ashburton, which has a storage capacity of 220 MG (2 underground tanks are currently under construction), and the Perry Hall



Tank, which has a usable storage capacity of 1.0 MG. The overflow elevation of Guilford Reservoir is 341.4 feet. The Lake Ashburton and Perry Hall Tank overflow elevations are both 353 feet. The Chapel Hill Tank will provide 2 MG of storage in the future after it is completed.

### **3.9.1-4 COLGATE SECOND ZONE**

The Colgate Second Zone of service supplies water to about 0.86 square mile of land in Baltimore County and 0.02 square mile in Baltimore City within the area served by the First Zone. The Colgate Pumping Station takes suction from the First Zone and pumps into the 0.30 MG Colgate elevated storage tank. This system supplies 0.5 MGD to predominantly residential consumers in the City. Ground elevations vary from 52 feet to 160 feet and the overflow elevation of the Colgate Tank is 258 feet.

### **3.9.1-5 EASTERN THIRD ZONE**

The Eastern Third Zone serves a "U-shaped" area of about 36 square miles, with approximately 40% within the City. Ground elevations in the zone range from 136 to 440 feet. The average annual demand is 29.4 MGD. This zone also supplies water to portions of Howard County.

The entire zone is predominantly residential with supporting business areas and some light industry. The type of use is: 68% percent domestic; 29% percent public-commercial; and 3% percent industrial. These percentages are projected to remain similar over the next 20 years. The annual average demand in Baltimore City is 18.2 MGD serving a population of 116,000.

Water is supplied to the Eastern Third Zone primarily by the Guilford Pumping Station, which takes suction from the Guilford Reservoir in the Second Zone. This supply is supplemented by the Cromwell Pumping Station and Fullerton Third Pumping Station. The Cromwell Pumping Station takes suction from the old 144-inch unlined Loch Raven-Montebello Tunnel about 4.5 miles north of the Montebello WFP. This tunnel was put into service in 1881 for the conveyance of Gunpowder Falls water from the old Loch Raven Dam to Lake Montebello but had been placed in reserve in 1940 when the new Gunpowder Falls-Montebello lined tunnel was put into service. For the operation of the Cromwell Pumping Station, the old tunnel was closed north of the Station. Filtered water is sent through the tunnel from Montebello WFP by gravity. The pumping station takes suction from a shaft to the tunnel, provides secondary treatment to the water as may be required, and discharges the water into the northeastern section of the zone. The Fullerton Third Pumping Station currently takes suction from the Fullerton transmission main in the First Zone.

All three pumping stations discharge into the Towson finished water reservoir, which is the only storage facility in the Eastern Third Zone. The Towson reservoir is located in Baltimore County but serves both the City and County. Suction is taken from this reservoir by the Towson Pumping Station, which supports upper zones in the distribution system. The Towson reservoir has a capacity of 16.0 MG at an overflow elevation of 515.5 feet.

### **3.9.1-6 WESTERN THIRD ZONE**

The Western Third Zone serves a large, sprawling area of approximately 36 square miles. It extends beyond the Baltimore City boundary to Pikesville on the northwest and to the Patapsco River on the west and south.



In land surface elevations, it ranges from 36 feet to 492 feet. The annual average demand for the zone is 43.2 MGD.

The Western Third Zone is predominantly residential, shopping centers, small mercantile districts, and light industries. In types of use, the water consumption is 33% percent domestic; 66% percent public-commercial; and 1.0% percent industrial. The commercial percentage is projected to increase and the residential percentage decrease over the next 20 years. The annual average demand in the City is 12.7 MGD and the population served is 138,000. The area served in the City is 18.33 square miles.

Water is supplied to the zone by the Ashburton and Leakin Park Pumping Stations, which both take suction from Lake Ashburton (construction of underground tanks is underway). Storage is provided by three (3) facilities: the Melvin Avenue Tank at Catonsville, with a capacity of 4 MG at an overflow elevation of 567.4 feet; the Pikesville Tanks, with a capacity of 21.4 MG at the same overflow elevation; and the Catonsville Reservoir with a capacity of 20 MG at an overflow elevation of 567.4 feet. All storage facilities are in Baltimore County.

### **3.9.1-7      FOURTH ZONE**

The Fourth Zone of service includes the Pikesville, Catonsville and Towson Fourth Zones. Both Pikesville and Catonsville Fourth Zones lie totally within Baltimore County and do not provide any service to Baltimore City. Only a very small area, 0.33 square miles, of the Towson Fourth Zone is located within the limits of Baltimore City. The zone serves approximately 1,500 City residents and has a City annual average demand of 0.144 MGD, less than one percent of the total demand in the zone. The type of usage in the City is almost entirely domestic with no industrial consumption. This distribution is not projected to change significantly in the next 20 years. Water is supplied to the Towson Fourth Zone by the Towson Pumping Station. The total storage capacity in the zone is 13.1 MG and is provided by the Mays Chapel Reservoir, capacity 12 MG; Stratford elevated tank, capacity 1.0 MG; and Cub Hill elevated tank 1.0 MG. All three facilities are located in central Baltimore County. Average demand is 31.3 MG.

### **3.9.1-8      FIFTH ZONE**

The Fifth Zone of service includes the Pot Springs, Sherwood, Reisterstown, Sparks and Falls Fifth Zones, all of which lie totally within Baltimore County and do not provide any service to Baltimore City. Average demand is 6.8 MG.

### **3.9.1-9      DISTRIBUTION SYSTEM PROJECTS**

The City's CIP contains numerous projects to improve, maintain, upgrade, and inspect the distribution system. These projects are described below, many of which are recurring projects, required to keep the system up to date and functioning efficiently.

- Water Infrastructure Rehabilitation – Program to rehabilitate water mains by cleaning and cement lining, looping dead end water mains, abandoning stubs, and replacing appurtenances in various communities as necessary. [Ongoing]
- Water Main Installation – installation of new water mains as needed to provide adequate water pressure and flows to serve users and fight fires, and performed in conjunction with other City agencies such as the Department of Transportation [Ongoing]





- Meter Replacement Program – Program to replace aging water meters with automated meter technology and convert in-house meters to outside pit settings, while also testing, repairing, and replacing large meters. [Ongoing]
- Water System Audit – Comprehensive program to reduce the percentage of water losses through verifying water production and distribution records, testing master meters, analyzing large and small meter consumption, properly sizing large and small meters, analyzing non-metered usage, recommending a cost effective small meter change-out program, analyzing meter pits for confined space issues, identifying areas of leakage in the distribution system, evaluating existing City practices regarding master and large meter calibrations, and recommending improvements to the City's existing procedures. [Complete]
- Monitoring and Condition Assessment Water Transmission Mains – Perform an inspection program to evaluate the condition of prestressed pipelines used to transmit potable water throughout the City's water distribution system. [Ongoing]
- Mapping Program (Water) – Program to provide updated and additional water utility information such as construction dates, material manufacturer, etc. and to coordinate with GIS system which includes utility, land base and property information [Ongoing].
- Chlorine Handling Safety Improvements – Provide safety improvements by eliminating gaseous chlorine at each of the fifteen chlorination facilities, including both Montebello Plants and substitution of sodium hypochlorite facilities. [Design Phase]
- Water Supply Tunnels Inspection and Rehabilitation – Investigate and rehabilitate, as necessary, the three main water supply tunnels: Liberty Reservoir to Ashburton WFP (raw water); Loch Raven Reservoir to Montebello WFP (raw water); and Montebello WFP to Ashburton WFP.
- Valve and Hydrant Exercising/Repair – Annual – Exercise, access and/or repair water valves and fire hydrants. [Ongoing]

### 3.10 PUMPING STATIONS

There are 21 filtered water pumping stations in active or standby use in the Central System. The combined nominal capacity of all the pumping stations is approximately 614.3 MGD with one pump on standby at each station.

Areas in the City are supplied with water by ten pumping stations: Ashburton, Guilford, Hillen, Leakin Park, and Vernon Pumping Station, located in the City; and Colgate, Cromwell, Fullerton Second, Fullerton Third, and Towson Pumping Station, located in the County. The safe capacity of the pumping stations serving the City is roughly 400 MGD. Also located in the City, but seldom used, is the Washington Boulevard Pumping Station. Its purpose is to pump water from the First Zone to the Second Zone and currently operates on standby.

There are currently Five finished water pumping station improvement projects in the CITY's CIP:

- Guilford Pump Station Rehabilitation – Rehabilitate and repair Guilford Water Pumping Station facility to maintain the operational function and performance reliability of aging systems and to address Citywide Homeland Security concerns. [Construction Phase]
- Vernon Pump Station Rehabilitation – Rehabilitate and repair Vernon Water Pumping Station facilities to maintain the operational function and performance reliability of aging systems and to address Citywide Homeland Security concerns. [DESIGN PHASE]



- Cromwell Pump Station Rehabilitation – Rehabilitate and repair Cromwell Water Pumping Station facilities to maintain the operational function and performance reliability of aging systems and to address Citywide Homeland Security concerns. [DESIGN PHASE]
- Towson Pump Station Rehabilitation – Rehabilitate and repair Towson Water Pumping Station facilities to maintain the operational function and performance reliability of aging systems and to address Citywide Homeland Security concerns. [DESIGN PHASE]
- Ashburton Pump Station Rehabilitation – Rehabilitate and repair Ashburton Water Pumping Station facilities to maintain the operational function and performance reliability of aging systems and to address Citywide Homeland Security concerns. [DESIGN PHASE]

### **3.11 STORAGE FACILITIES**

Current and future finished water storage for the Central System consists of 816 MG of storage. More than 704 MG of elevated and ground storage is concentrated in the First and Second Zones. Storage facilities located in the City include the Curtis Bay Tank, Druid Lake, Guilford Reservoir, Lake Ashburton and Montebello Finished Water Reservoirs, while Catonsville Reservoir, Colgate Tank, Melvin Avenue Tank, Perry Hall Tank, Pikesville Reservoir and Towson Reservoir are in Baltimore County but serve both the City and County. Future storage which has yet to be completed consists of Fullerton Reservoir (40 MG), Chapel Hill Tank (2 MG), Catonsville Reservoir Expansion (32 MG), Mays Chapel Reservoir Expansion (6 MG), Bond Ave. Tank (1 MG), and Knox Ave. Tank (0.5 MG). Storage volumes are broken down into pressure zones in Table 3-8.

#### **3.11.1 UNCOVERED FINISHED WATER RESERVOIRS**

The requirements set forth in the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) require the City to cover or abandon its uncovered finished water reservoirs. The City has complied by initiating action at the seven uncovered finished water reservoirs in the Central System. Three of these reservoirs Montebello 2, Pikesville and Towson have been completed and are in service. Fullerton and Guilford are in the final stages of construction while the remaining two are under construction.

Project descriptions pertaining to the uncovered finished water reservoirs are listed below:

- Ashburton Finished Water Reservoir Improvements – Constructing of covered Tanks, including valve replacements and control improvements.
- Druid Lake Finished Water Reservoir Improvements – Constructing covered Tanks, including valve replacements and control improvements.
- Earthen Dam Improvement Program – Rehabilitation of interior/exterior slopes. Druid Lake, Lake Ashburton, Lake Montebello and Montebello Washwater Lake are all included in the Earthen Dam Improvement Program.
- Guilford Finished Water Reservoir Improvements – Constructing of covered tanks at Guilford Finished Water Reservoir, including valve replacements and control improvements.



Name	Pressure Zone	Capacity/ Fut. Capacity (M.G.)	Type
First Zone			
Druid Lake	First Zone	364.5	Reservoir
Montebello Filtration Plant Storage	First Zone	36.7	Reservoir
Curtis Bay Tank	First Zone	4	Ground Storage Tank
Fut. Fullerton Reservoir	First Zone	40	Reservoir
First Zone Total		445.2	
Second Zone			
Lake Ashburton	Second Zone	220	Reservoir
Guilford Reservoir	Second Zone	36.1	Reservoir
Colgate Tank	Colgate Second Zone	0.3	Elevated Storage Tank
Perry Hall Tank	Second Zone	1	Elevated Storage Tank
Fut. Chapel Hill Tank	Second Zone	2	Elevated Storage Tank
Second Zone Total		259.4	
Third Zones			
Towson Reservoir	Eastern Third Zone	15.6	Reservoir
Pikesville Reservoir	Western Third Zone	21.4	Reservoir
Melvin Ave. Tank	Western Third Zone	4	Ground Storage Tank
Catonsville Reservoir	Western Third Zone	20	Reservoir
Fut. Catonsville Reservoir	Western Third Zone	32	Reservoir
Third Zone Total		93	
Fourth Zones			
Rolling Road Tank	Catonsville Fourth Zone	1.5	Elevated Storage Tank
Dorchester Tank	Catonsville Fourth Zone	1	Elevated Storage Tank
Deer Park Tank	Pikesville Fourth Zone	1	Elevated Storage Tank
Owings Mills Reservoir	Pikesville Fourth Zone	5.3	Reservoir
Randallstown Tank	Pikesville Fourth Zone	0.3	Elevated Storage Tank
Pleasant Hill Tank 1	Pikesville Fourth Zone	1	Elevated Storage Tank
Pleasant Hill Tank 2	Pikesville Fourth Zone	0.3	Elevated Storage Tank
Mays Chapel Reservoir	Towson Fourth Zone	6.1/12	Reservoir
Stratford Tank	Towson Fourth Zone	1	Elevated Storage Tank
Club Hill Tank	Towson Fourth Zone	1	Elevated Storage Tank
Fourth Zone Total		12.4	
Fifth Zones			
Chartley Tank	Reisterstown Fifth Zone	1	Elevated Storage Tank
Reisterstown Tank	Reisterstown Fifth Zone	0.3	Elevated Storage Tank
Fut. Bond Ave. Tank	Reisterstown Fifth Zone	1	Elevated Storage Tank
Falls Tank	Falls Fifth Zone	0.5	Elevated Storage Tank
Fut. Knox Ave. Tank	Falls Fifth Zone	0.5	Elevated Storage Tank
Sherwood Tank	Sherwood Fifth Zone	0.25	Elevated Storage Tank
Springlake Tank	Pot Springs Fifth Zone	0.4	Elevated Storage Tank
Springdale Tank	Pot Springs Fifth Zone	1	Elevated Storage Tank
Sparks Tank	Sparks Fifth Zone	1	Elevated Storage Tank
Fifth Zone Total		5.95	
Distribution Total		815.95	

**TABLE 3-8: TOTAL STORAGE IN EACH PRESSURE ZONE**

**NOTE:** Underground tanks will be constructed for the following lakes.





- Druid Lake, 2 Under Ground Tanks-52 MG (Construction Phase)
- Montebello Filtration Plant Storage, 2 Under Ground Tanks-32.03 MG (Construction Complete)
- Fullerton Reservoir, 3 Stand pipe Tanks-62 MG (Construction Phase)
- Lake Ashburton, 2 Under Ground Tanks-50 MG (Construction Phase)
- Guilford Reservoir, 2 Under Ground Tanks-13.6, (Construction Phase)
- Towson Reservoir (2 Underground Tanks-16 MG (Construction Complete)

### **3.12 WATER FINANCE**

In November 1978, the voters of the City approved the Charter Amendment establishing the Water Utility as a separate enterprise and requiring that the Water Utility be financially self-sustaining and operated without profit or loss to the other funds or programs of the City. In addition, the Charter Amendment requires the City to approve a separate budget for the Water Utility.

As required by the Charter Amendment, the City Council adopted Ordinance 941 in December 1978, establishing, among other things, a mechanism for the determination of rates and charges. Ordinance 941 requires that the Board of Estimates, upon the recommendation of the Director of Finance and the Director of Public Works, establish rates and charges sufficient to make the Water Utility self-supporting at all times and that it adjust the rates if the projected statement of results for the immediate prior year resulted in a loss or deficit. In addition, Ordinance 941 requires that the rates so established shall be at a level sufficient to recover any accumulated deficit from prior years.

The City Board of Estimates establishes rates and charges for customers within Baltimore City as well as the wholesale rates for treated water charged to Howard and Anne Arundel Counties and the wholesale rate for untreated water charged to Carroll County. Under a 1992 Agreement, the City supplies Harford County with untreated water at cost. Under provisions of Chapter 539 of the Laws of Maryland of 1924, the City is obligated to supply water to Baltimore County at cost. The current method of determining cost to serve the County is set out in a City-County Water Agreement dated September 20, 1972, as amended by the 1991 Arbitration Panel ruling. Among the costs apportioned are those of operation and maintenance and administration, major repairs and capital projects during construction.

Customers in Baltimore County are served through individual meters but are billed by the City at rates recommended by the County with City concurrence, rather than based on rates established by the City. Following the end of each fiscal year, when the information for the Water Utility's actual cost for that period and the County's share of usage is available, City and County officials meet to reach agreement on costs to be paid by the County, based on the Arbitration Panel's decision. If the revenues from billings to County customers exceed the agreed costs, the City remits the excess to the County within 60 days; if there is a shortfall, the County must pay the difference to the City within 60 days.

The revenues of the Water Utility are primarily derived from water sales, with a minor amount of revenues generated by charges for other services and rental income, penalty charges for late payment and interest earnings on investments. Water Utility customers in Baltimore City and Baltimore County are billed quarterly based on a minimum quarterly charge and consumption charges per one hundred cubic feet.

Because of escalating operating and capital costs related to aging infrastructure, homeland security, and meeting federal and state environmental laws and regulations, the City approved consecutive 9.9% annual



rate increases effective in July 2020 and July 2021 (see table 1-1). In order to mitigate the impact on the City's low-income customers, a Low-Income Assistance Program was initiated in April 2005. This crisis intervention program was established to prevent water service cut-off due to delinquency. It is expected that the recent annual rate increases as well as projected future rate increases will provide an incentive for some customers to implement conservation measures. The Utility is also taking internal measures to promote water conservation efforts and reduce unaccounted for water through a comprehensive program of water main rehabilitation, water system audits, valve exercising, and securing fire hydrants to prevent unauthorized access.

#### **MARYLAND WATER CONSERVATION PLUMBING FIXTURES ACT**

As part of the 1984 Chesapeake Bay Initiatives, the General Assembly enacted HB 976, which amended the water and sewerage planning law, and the Secretary of Health and Mental Hygiene proposed to adopt this as a new Regulation .07 under COMAR 10.17.01, Planning Water Supply and Sewerage Systems.

The purpose of this action is to satisfy the legal mandate of HB 976, a 1984 amendment to Title 9, Subtitle 5 (Section 9-505), Health-Environmental Article, Annotated Code of Maryland, which requires that counties document in their water and sewerage plans their programs for compliance with the Maryland Water Conservation Plumbing Fixtures Act (MWCPFA), Article 56, Section 445, Annotated Code of Maryland.

The Building Inspections Section under the Neighborhood Progress Administration/DHCD is responsible for enforcement of MWCPFA in the City of Baltimore. Building Permits for new buildings and major renovations are now issued with a stipulation for compliance with MWCPFA. Final field approval is also predicated on these conditions.



## CHAPTER 4 - WASTEWATER COLLECTION AND TREATMENT

### 4.1 INTRODUCTION

The Baltimore Wastewater System serves the City of Baltimore and sections of Anne Arundel, Baltimore, and Howard Counties. Areas within the City are essentially fully developed, while major urban expansion continues to occur in the adjacent county areas. Future development from outside the City's boundaries is expected to provide the primary growth of wastewater demand. In order to meet anticipated increasing demands and environmental regulations for wastewater services, it is necessary to maintain a system so that the physical condition of the system does not interfere with treatment.

The City is continuously engaged in the planning and development of improvements to the system to meet these demands. The FY-2021 Capital Improvement Program (CIP) for the City's wastewater system for FY 2022 through 2027 are provided in Appendix A Exhibit A and total over \$1.2 Billion of improvements.

The wastewater system comprises a network of sanitary sewers, force mains pressure mains, and pumping stations which convey the waste to two wastewater treatment plants. The planning, engineering, and construction of the wastewater system are the responsibility of the Office of Engineering and Construction, Bureau of Water and Wastewater. The operation and maintenance of the pumping stations and wastewater treatment plants are the responsibility of the Wastewater Facilities Division, Bureau of Water and Wastewater. Maintenance of the sewers in Baltimore City is the responsibility of the Utility Maintenance Division, Bureau of Water and Wastewater. As a result of the Chesapeake Bay Restoration efforts, the City has completed Enhanced Nutrient Removal (ENR) upgrade designs at the Patapsco and Back River Wastewater Treatment Plants. The combined total ENR construction cost at both facilities is nearing \$1.0 Billion.

### 4.2 DISCHARGE PERMITS

A list of the City's discharge permit numbers is provided in Table 4-1. A complete list of all permit holders in the City can be obtained through MDE.

FACILITY NAME	DISCHARGE PERMIT NUMBERS
Ashburton Water Filtration Plant	11DP0681
Back River Wastewater Treatment Plant	15-DP-0581
Baltimore City Composting Facility	11DP2304
Baltimore City Municipal Separate Storm Sewers	11DP3315
Bowley's Lane Landfill	12SW0254
Cold Spring Landfill	02SW1211
Montebello Water Filtration Plant	11DP0630
Patapsco Wastewater Treatment Plant	15-DP-0580
Quarantine Road Landfill	02SW0257
Reedbird Avenue Landfill	12SW0252
Woodberry Quarry Landfill	02SW0255

**TABLE 4-1: LIST OF DISCHARGE PERMIT NUMBERS**

### 4.3 POPULATION PROJECTIONS, FLOW ESTIMATES, AND ALLOCATION AGREEMENTS

The City/County population projections, wastewater flow projections and capacity allocations are presented in Table 4-2 for both wastewater treatment plants. Billing information from Anne Arundel and Baltimore Counties was used to determine FY 2020 usage data. The billing reports are located in Appendix C as Exhibit C, Exhibit D and Exhibit E.





Service Area		2010 Census & FY 2010 Flows			FY 2020 Flows & Populations			2025 Flow & Population Projections			2030 Flow & Population Projections			2035 Flow & Population Projections			2040 Flow & Population Projections			2045 Flow & Population Projections		
		Population	GPCD	Demand (MGD)	Population	GPCD	Demand (MGD)	Population	GPCD	Demand (MGD)	Population	GPCD	Demand (MGD)	Population	GPCD	Demand (MGD)	Population	GPCD	Demand (MGD)	Population	GPCD	Demand (MGD)
City of Baltimore **	Back River WWTP**	522,895	153.42	80.22	501,059	152.9	76.61	505,244	150	75.79	510,213	150	76.53	515,955	150	77.39	522,111	150	78.32	526,414	150	78.96
	Patapsco WWTP **	98,066	226.38	22.2	93,971	172.39	16.2	94,756	170	16.11	95,687	170	16.27	96,765	170	16.45	97,919	170	16.65	98,726	170	16.78
Anne Arundel County *	Back River WWTP	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Patapsco WWTP **	36,263	104.79	3.8	39,002	121.79	4.75	39,913	125	4.99	40,797	125	5.1	41,569	125	5.2	42,233	125	5.28	43,000	125	5.38
Baltimore County *	Back River WWTP **	427,310	161.19	68.88	465,670	105.53	49.14	471,275	125	58.91	476,130	125	59.52	483,329	125	60.42	492,835	125	61.6	500,035	125	62.5
	Patapsco WWTP **	265,616	125.9	33.44	292,134	99.65	29.11	294,314	125	36.79	296,983	125	37.12	301,517	125	37.69	305,496	125	38.19	308,553	125	38.57
Howard County Total *	Back River WWTP	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Patapsco WWTP **	64,857	153.11	9.93	83,970	117.3	9.85	88,534	125	11.07	91,158	125	11.39	92,320	125	11.54	92,399	125	11.55	92,800	125	11.6
Total	Back River WWTP	950,205	156.91	149.1	966,729	130.08	125.75	976,519	137.93	134.7	986,343	137.93	136.05	999,284	137.91	137.81	1,014,946	137.86	139.92	1,026,449	137.82	141.46
	Patapsco WWTP	464,802	149.25	69.37	509,077	117.68	59.91	517,517	133.24	68.96	524,625	133.21	69.88	532,171	133.18	70.88	538,047	133.19	71.67	543,079	133.18	72.33
Combine Total WWTPS		1,415,007	154.39	218.47	1,475,806	125.8	185.66	1,494,036	136.32	203.66	1,510,968	136.29	205.93	1,531,455	136.27	208.69	1,552,993	136.24	211.59	1,569,528	136.21	213.79

TABLE 4-2: THE CITY/COUNTY POPULATION PROJECTIONS, FLOW PROJECTIONS AND CAPACITY ALLOCATIONS

Notes:  
Flows for FY 2010 and FY 2020 are based on Annual City of Baltimore DPW reports.  
Projected Flows (FY 2025 thru FY 2045) include residential, commerical, industrial and I&I flows.  
FY 2025 thru FY 2045 Per Capita Flows estimated by City of Baltimore DPW, based on FY 2010 and FY 2020 data.  
FY 2045 Projected Flows for Anne Arundel and Howard Counties estimated by City of Baltimore DPW, based on FY 2020 data.  
Back River WWTP Permitted Capacity = 180 MGD  
Back River WWTP Permitted Capacity = 73 MGD  
Combined Capacity = 253 MGD  
\*City & County Population Source - Maryland Department of Planning, Data Center (December 2020)  
\*\* Population Served Source - City & County Water & Wastewater Plans



The data presented in Table 4-2 includes actual FY 2010 and FY 2020 flows and populations served and clearly documents the successes of the City and Counties Wet Weather Programs by way of Per Capita Flow reductions at Back River WWTP from nearly 157 GPD to 130 GPD and at Patapsco WWTP from nearly 150 GPD down to less than 118 GPD over the 10-Year period. Due to the documented I&I reductions, the Per Capita Flow projections have been reduced for the FY 2025 thru FY 2045 making the current Permit Capacity of each Plant adequate through 2045.

#### 4.4 WASTEWATER COLLECTION AND CONVEYANCE SYSTEMS

The City of Baltimore's Wastewater system serves approximately 1.5 million people in the metropolitan area. Brief descriptions of the each of the eight sewersheds comprising the wastewater collection system follows. Figures 4-1 and 4-2 illustrates the drainage areas for each of the wastewater collection systems. A map of the system piping within the City's limits is also provided.

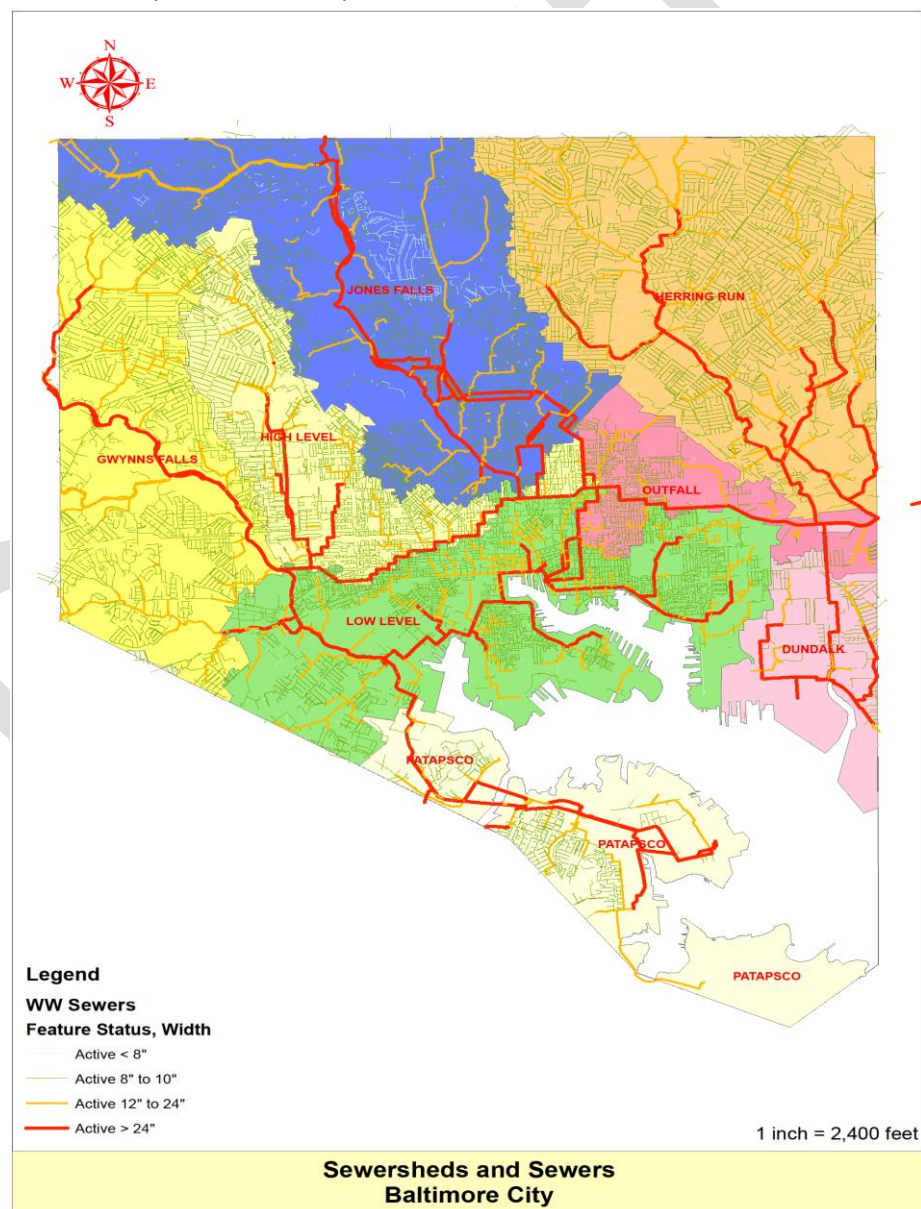
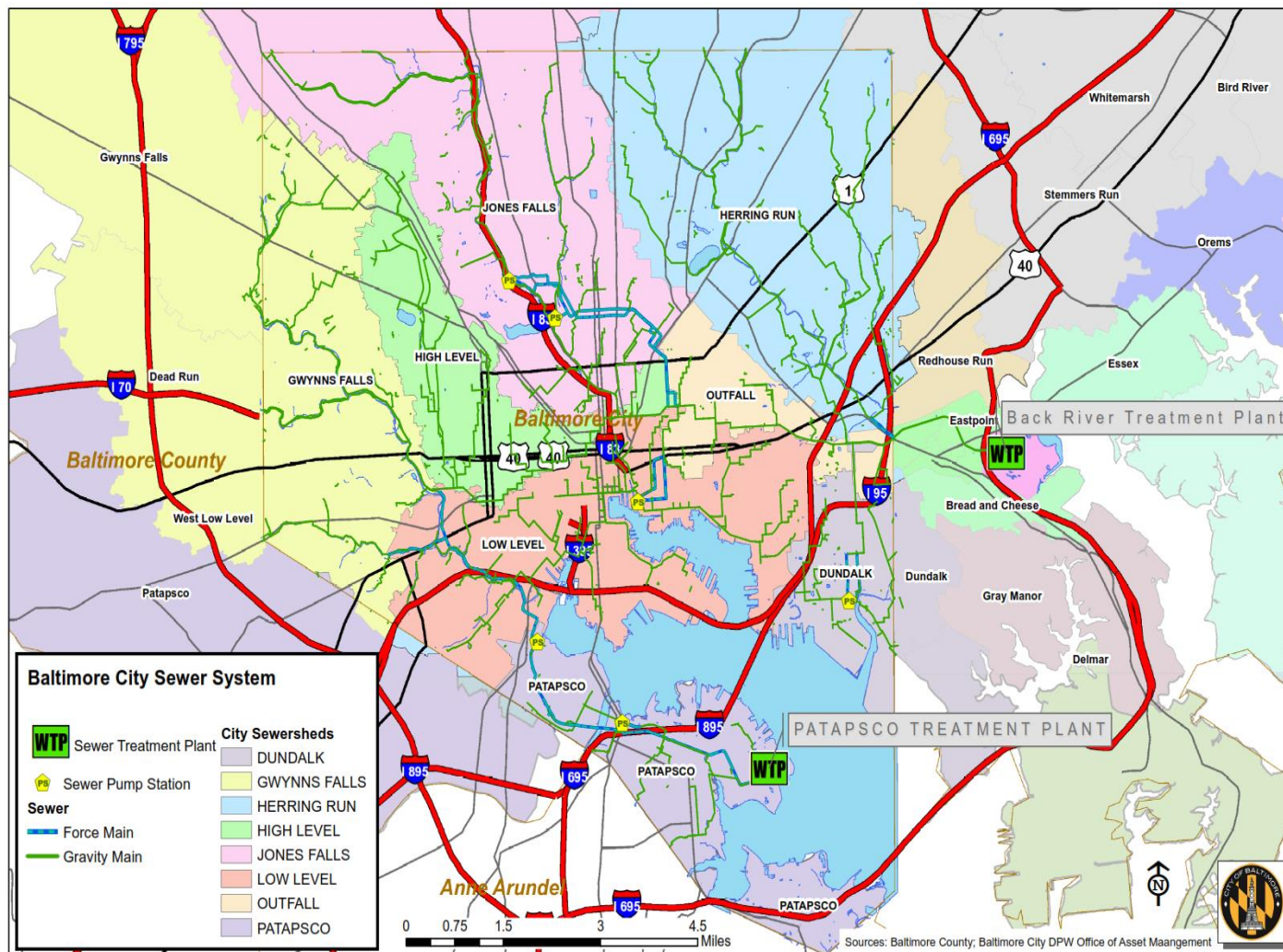


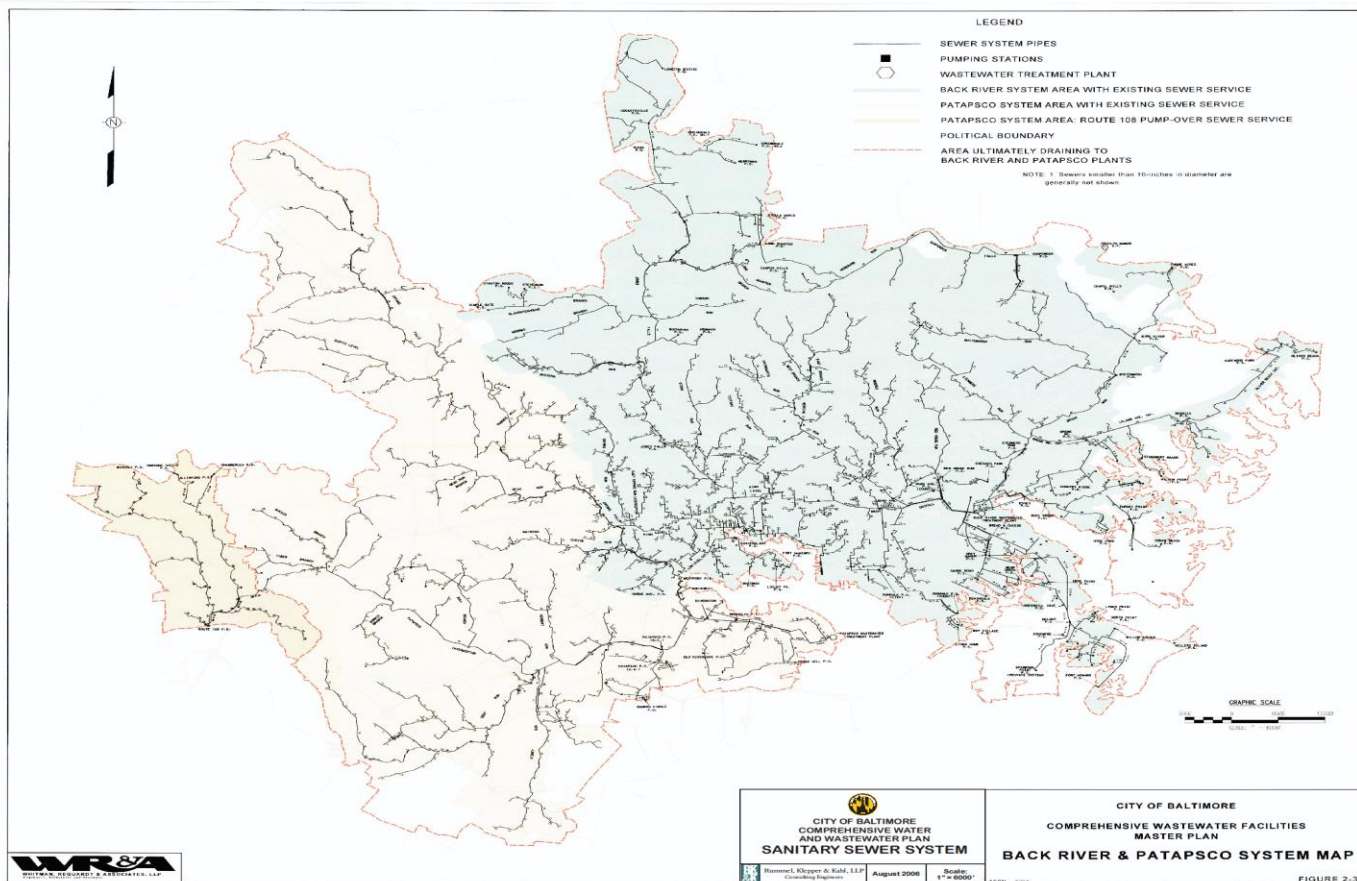
Figure 4-1A: Sewersheds and sewers Baltimore City



**Figure 4-1B: Sewersheds and sewers Baltimore City**

A map of the system piping for the whole Central System is located in Figure 4-2. Within the City's limits, there are no areas that have a combined sewer system. The collection system infrastructure is aging and the City has known inflow and infiltration problems. These issues have been identified by the sewershed evaluations noted previously and are being addressed through the Capital Improvement Program as well as management, operations, and maintenance changes within the Baltimore City Department of Public Works. The City maintains 1,400 miles of sanitary sewers within the total 3,100-mile system serving the metropolitan area Figure 4-3



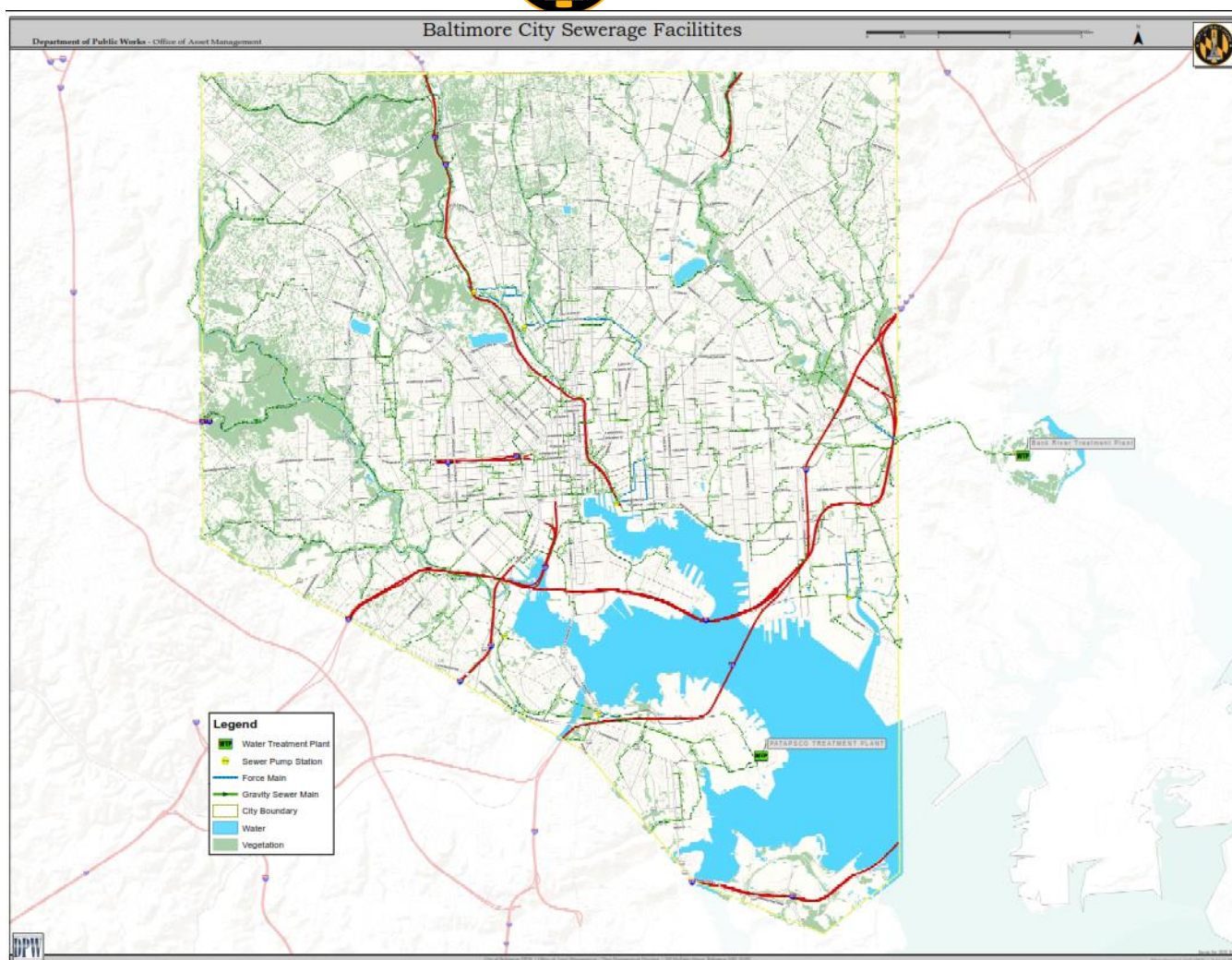


**Figure 4-2: Back River and Patapsco System Maps**

Nine wastewater pump stations listed below and 9 minor installations to convey the wastewater to either the Back River or Patapsco Wastewater Treatment Plants

Wastewater Pump Station	Number of Pumps	Max. Station Capacity (mgd)	FY2020 Average Day Capacity (mgd)	Force Main Diam. (inches)
Brooklyn	3	18.0		30"
Dundalk	4	33.0		36"
Jones Falls	4	54.0		36"
Eastern Ave.	5	100.0		60" & 42"
Locust Point	2	3.6		12"
McComas St.	3	1.5		10"
Quad Ave.	3	20.0		36"
Westport	3	4.0		14"
Lower Stony Run	3	17.0		30"

**TABLE 4-3: Flow Data Pumping Stations and Force Mains**



**Figure 4-3: Baltimore City Sewerage Facilities**

## **4.5 MODIFIED CONSENT DECREE**

Baltimore City entered into a Modified Consent Decree on October 6, 2017 with the Environmental Protection Agency (EPA) and the Maryland Department of the Environment (MDE), which requires the City to conduct sewer main inspections for pipes equal to or greater than 20 inches by October 2024. The projects are included in the CIP in Appendix A.

A copy of the Modified Consent Decree and Quarterly Reports can be obtained on the City's web page ([www. BaltimoreCity.gov](http://www.BaltimoreCity.gov)).

The Consent Decree measures complement the ongoing efforts made by the City to eliminate sanitary sewer overflows (SSO), as well as to upgrade and rehabilitate its wastewater collection system. The City is implementing a Capacity Assurance, Management, Operations, and Maintenance (CMOM) program. These improvements will ultimately protect Baltimore's harbor, Maryland's streams, the Chesapeake Bay and the property of the citizens of Baltimore.

## **4.6 WASTEWATER SYSTEM SERVICE AREA**

The City's Consent Decree Compliance Program is an ongoing program that includes Consent Decree program management, program management for the City's sewershed projects, a City wide hydraulic model,



Geographic Information System (GIS) and Management Information System (MIS) enhancements, pumping station evaluations, valve inspection and repair, and an Emergency Response Plan. The sewersheds listed in the Consent Decree are below.

### **DUNDALK SEWERSHED**

The Dundalk Sewershed is located on the southeastern corner of the City, below the Outfall Sewershed and adjacent to the Low Level Sewershed. It is approximately 17.2 square miles, with approximately 3.9 square miles within the City limits. The City portion serves residential areas and includes heavy industrial and commercial areas. The collection system includes approximately 152,000 linear feet of pipe ranging from 8 to 66 inches in diameter, 600 manholes and the Dundalk Pump Station which discharges into a large interceptor in the Outfall Sewershed before conveyance to the Back River WWTP for treatment and disposal.

### **GWYNNS FALLS SEWERSHED**

The Gwynns Falls Sewershed is located on the northwestern portion of the City west of the High Level and Low Level Sewershed areas. It is approximately 13.1 square miles of the City service area. A major portion of the area is residential with commercial corridors and a significant area of City owned parkland. The collection system includes approximately 980,000 linear feet of gravity sewer ranging from 6 to 102 inches in diameter; approximately 5,200 manholes and the Westport Pump Station to convey wastewater to the Patapsco WWTP for treatment and disposal.

### **HIGH LEVEL SEWERSHED**

The High Level Sewershed is located within the City between the Gwynns Falls and the Jones Falls Sewersheds.

The High Level drainage area is 7.2 square miles and includes approximately 924,000 linear feet of gravity sewer ranging from 8 to 100 inches in diameter; approximately 5,000 manholes; and the Low Level Sewershed wastewater is conveyed to the Back River WWTP for treatment and disposal.

### **HERRING RUN SEWERSHED**

The Herring Run Sewershed is located in the northwestern portion of the City and covers a City drainage area of approximately 17.9 square miles and includes 1.57 million linear feet of gravity sewers ranging from 6 to 72 inches in diameter; approximately 7,200 manholes and the Quad Avenue Pump Station to convey wastewater to the Back River WWTP for treatment and disposal.

### **JONES FALLS SEWERSHED**

The Jones Falls Sewershed is located on the northwestern portion of the City between the Jones Falls and Herring Run Sewersheds. The City's portion of the Jones Falls drainage area is approximately 16.5 square miles, with approximately 1.6 million linear feet of gravity sewer ranging from 6 to 75 inches diameter; over 8,000 public and private manholes and the Jones Falls and Stony Run Pump Stations to convey wastewater to the Back River WWTP for treatment and discharge.

### **LOW LEVEL SEWERSHED**

The Low Level Sewershed is located on the downtown central business district and is adjacent to the City's harbor area and covers a drainage area of 13.3 square miles. The City's portion of the Low Level Sewershed





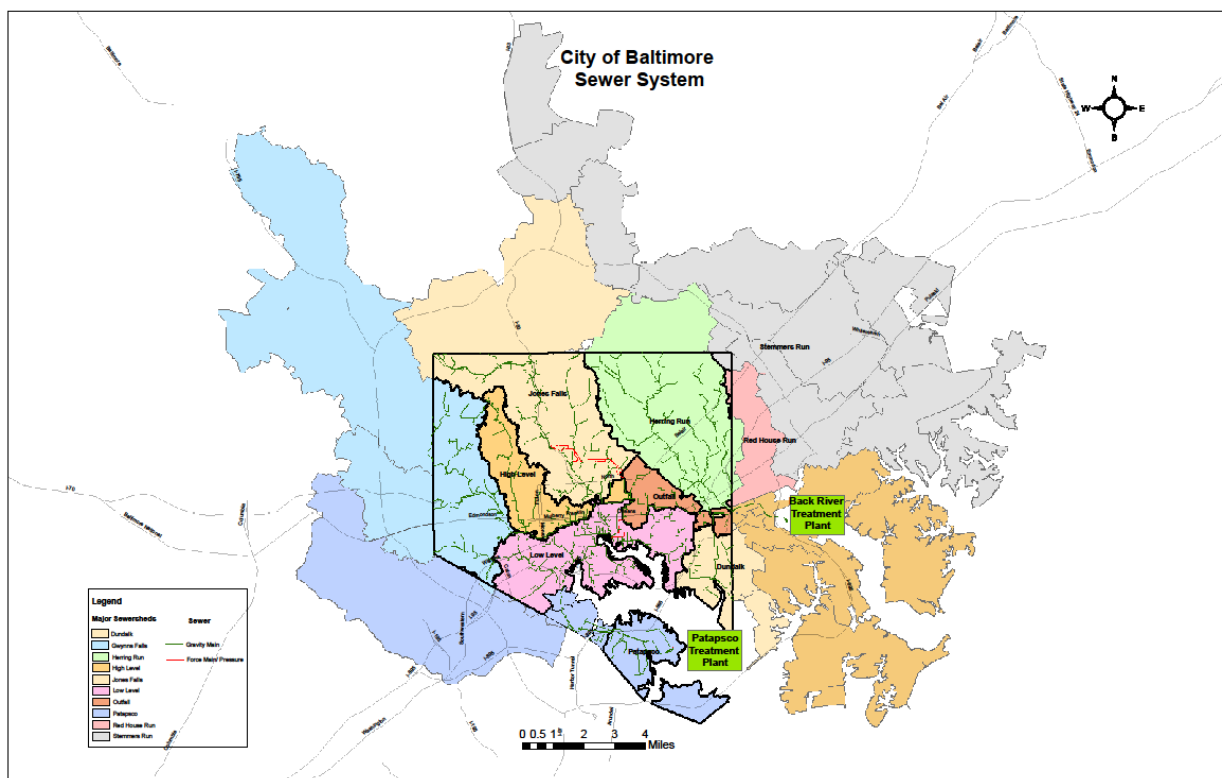
includes approximately 1.4 million linear feet of gravity sewer ranging from 6 to 84 inches in diameter; approximately 8,500 manholes; and the Eastern Avenue Pump Station, the Locust Point Pump Station and the McComas Street Pump Station to convey wastewater to the Back River WWTP for treatment and disposal.

### **OUTFALL SEWERSHED**

The Outfall Sewershed in the central eastern portion of the City south of the Herring Run Sewershed and north of the Low Level and Dundalk Sewersheds. The drainage area of the Outfall Sewershed within the City limits is approximately 3.6 square miles and includes approximately 328,000 linear feet of gravity sewers with approximately 1,800 manholes. Wastewater is conveyed to the Back River WWTP for treatment and disposal.

### **PATAPSCO SEWERSHED**

The Patapsco Sewershed is located on the southern end of the City. The drainage area of the Patapsco Sewershed is approximately 7.8 square miles and includes 268,285 linear feet of gravity sewers ranging from 4 to 64 inches in diameter; 1303 manholes and Westport and Brooklyn Pump Stations to convey wastewater to the Patapsco WWTP for treatment and disposal.



**FIGURE 4-4: BALTIMORE SEWERSHED**



## **4.6.1 OTHER COLLECTION SYSTEM PROJECTS**

There are several other improvement projects in the City's CIP which are not associated with the Consent Decree. These projects (not inclusive), listed below, include general maintenance and upkeep of the system, as well as some specific projects.

1. Dundalk Avenue Pumping Station Force Main Improvements – Evaluation, design, and construction of improvements due to a number of emergency repairs required over the past several years.
2. Clinton Street Pumping Station Force Main Improvements – Design and construction of improvements to the Clinton Street Pump Station Force Main due to a number of emergency repairs.
3. GIS Updates and Mapping Program (Wastewater) – Continuation of City's program to provide updated citywide base maps which include topography, utility, building lines, and data from Consent Decree Sewershed Studies and Designs [Ongoing]
4. House Lateral Connection Upgrade Program – Rehabilitation, repair, and replacement of defective house laterals.
5. I/I Correction Program – Program designed to detect and correct infiltration and inflow of clear water into sanitary sewers [Ongoing]
6. Sanitary Sewer Inspection Services – Inspection of sanitary sewer pipes, manholes, structures and appurtenances. [Ongoing]
7. Sewer Replacement Projects – Unscheduled replacement and improvements to sewers which are necessary to continue proper conveyance of wastewater overflows through unserviceable sewers due to badly deteriorated pipe, unrepairable leaks, and other major sewer failures. [Ongoing]
8. Urgent Need Sanitary Services – Rehabilitation, investigation, and design of sanitary sewers at various locations. [Ongoing]

## **4.7 WASTEWATER TREATMENT PLANTS**

Wastewater within the City's collection system is treated at the Back River and Patapsco Wastewater Treatment Plants (WWTP). The City has given consideration to the Chesapeake Bay Agreement and EPA requirements when developing priorities for recent and future projects, such as point discharges and addressing biological nutrient removal (BNR) and enhanced nutrient removal (ENR). A schematic of the Sewersheds for the City of Baltimore shows how the Sewersheds are connected to the Wastewater Treatment Plants, Figure 4-2. The following projects address needs at both treatment plants:

- Annual Facilities Improvements – Rehabilitate, repair, and/or replace wastewater facility systems to maintain the operational function and performance reliability of aging systems.
- Comprehensive Biosolids Management Plan – Evaluation, design and construction of long-term biosolids management, stabilization, and disposal facilities.
- Wastewater Facilities Security Improvements – Add, modify and upgrade security systems at wastewater and treatment facilities in response to Federal regulations and other security measures.



The FY 2021 CIP budget for the Wastewater Facilities improvements is \$157.4 Million

Owner		Type Treatment	Plant Coordinate Location	Point of Discharge*	Existing (MGD) Capacity	FY 2020 Average Flows (MGD)	Operating Agency
Baltimore City	Back River WWTP	Liquid Treatment(Preliminary, Primary, Secondary, and Tertiary) and Solid Treatment (Thickening, Stabilization, and Dewatering)	Latitude: 39° 17' 53.754" N Longitude: 76° 29' 46.082" W	Listed in NPDES Permit	180.00	126.09	Baltimore City-DPW
	Patapsco WWTP	Sewage Treatment Plants (Primary Treatment, Secondary Treatment and Tertiary Treatment)	Latitude: 39-13'59" N Longitude: 076-33'58" W	Listed in NPDES Permit	73.00	60.07	Baltimore City-DPW

**TABLE 4-4: City of Baltimore Wastewater Treatment Plants**

## 4.7.1 BACK RIVER WASTEWATER TREATMENT PLANT

The Back River WWTP is an advanced treatment facility having a permitted capacity of 180 MGD. The plant presently serves a population of approximately 967,000 in Baltimore City and Baltimore County. The plant is situated on a 466-acre site on the west shore of Back River, approximately two miles east of the Baltimore City line. The Back River service area is approximately 140 square miles, 60 of which lies within Baltimore City.

### 4.7.1.1 FUTURE DEVELOPMENT OF BACK RIVER WWTP

Back River improvements include some significant projects that will be undertaken as part of a construction program through 2030 :

- Enhanced Nutrient Removal at Backriver WWTP – Construction and modification of existing Biological Nutrient Removal (BNR) Facilities to optimize the removal of ammonia and nitrogen from the Back River Wastewater Treatment Plant effluent, has been completed.
- Back River Plant-Wide Odor Control – Study, design and construction of plant-wide control facilities.
  - Comprehensive Biosolids Management.
  - Back River Effluent Filters Rehabilitation
- Back River Sparrows Point Outfall – Evaluate existing Sparrows Point Outfall to determine options for continued use. Design and construct identified improvements.
- Back River WWTP Primary Influent Facilities Rehabilitation – Evaluate capacity of Back River WWTP primary and influent facilities to handle anticipated future flows, design and construct modifications and/or additions to the facilities currently in construction



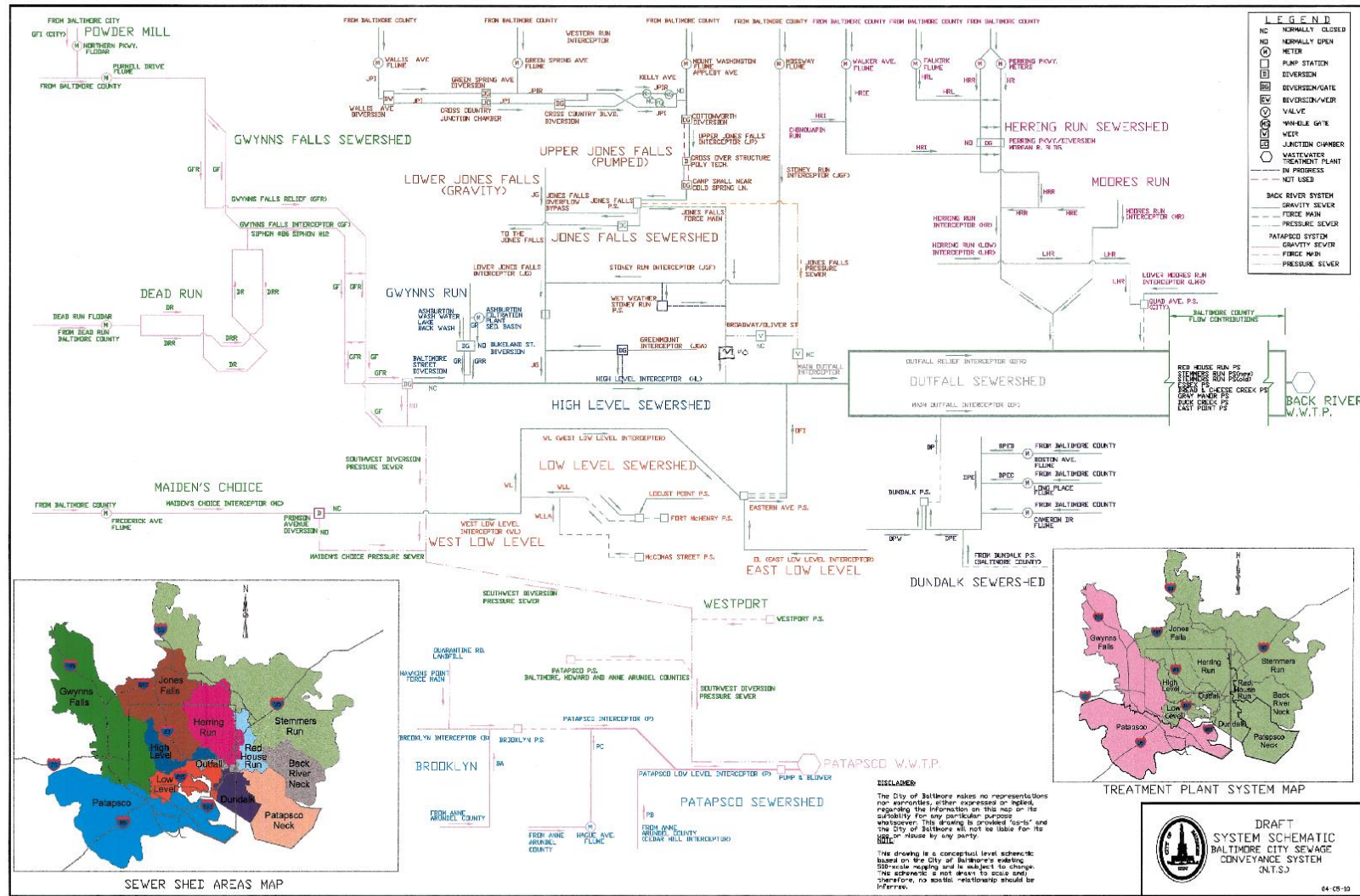


FIGURE 4-5: BALTIMORE CITY SEWER CONVEYANCE SYSTEM



## **4.7.2 PATAPSCO WASTEWATER TREATMENT PLANT**

The Patapsco WWTP is an advanced treatment facility which has a Permitted capacity of 73 MGD (this capacity can be officially increased up to 81 MGD, following the MDE review of facility performance documentation and MDE approval). The plant is situated on a 65-acre site in the southern part of the City at Wagner's Point, north of the Curtis Bay area, and serves portions of the City as well as portions of Baltimore, Anne Arundel and Howard Counties. This plant serves a population of approximately 509,000.

### **4.7.2.1 FUTURE DEVELOPMENT OF PATAPSCO WWTP**

The Patapsco WWTP anticipates increased population and flow projections for the plant service area. The following are some projects of significance for efficient operation of the plant.

- Headworks Improvements
- Power Reliability Improvements
- Fine Screen Facility Rehabilitation
- Secondary Reactor Rehabilitation
- Low Lift Pumping Station Rehabilitation
- Liquid Oxygen Plant Facility Rehabilitation

## **4.8 SUMMARY OF WASTEWATER FACILITIES**

The purpose of the Comprehensive Water and Wastewater Facilities Master Plan was to determine what improvements were needed for a 25-year planning period (2020 – 2045) with respect to capacity and water quality. According to this report, the facilities at the Back River Plant have adequate capacity to handle future flows and most anticipated treatment requirements, including solids handling, for the 25-year period. Based on the 2045 flow projections for the Patapsco Wastewater Treatment Plant service area, 73 MGD permit capacity is projected to meet the projected capacity for the 25-year planning period, based on continued wet weather program successes. The focus of the report was to provide planning level information to determine future treatment options required for the Back River and Patapsco Treatment Plants. Other significant issues addressed by the plan included: water quality, population, wastewater flows and characteristics, existing facilities, solids production and sludge management, and costs to reduce, convey and treat inflow. The report summarized several findings and recommendations, which are listed below:

- Current service area populations, wastewater flows and sludge production for Back River and Patapsco systems are predicted to remain relatively constant throughout the planning period, except for wet-weather occurrences.
- For TN reduction to levels of 4 mg/L, carbon oxidation/nitrification suspended growth plus deep denitrification filters have been completed at the Patapsco and Back River WWTPs.
- Due to the recently completed and current improvement/rehabilitation contracts at both plants, in general, they are in condition to perform through the planning period.
- Specific facilities are currently being evaluated to determine requirements for rehabilitation/improvements. Back River facilities include the Primary Effluent Channel, Plant Effluent Outfall and exterior lighting.
- The current sludge management plan for Back River and Patapsco is successful, provides flexibility, reliability and redundancy and has adequate capacity to continue beneficial reuse of all sludge throughout the planning period. (Privatization contracts will require renewal when they expire.)
- Install supplementary pipes and outfall for discharge of Back River Plant effluent to the Patapsco River.



- Implement remaining necessary improvements/rehabilitation contracts at Back River and Patapsco.

## 4.9 JURISDICTIONAL FLOW ALLOCATION/AGREEMENTS

Information regarding the jurisdictional flow allocations is provided in Appendix A Exhibit E. The current flow allocation figures are provided in Table 4-3. A list of the inter-jurisdictional agreements is provided in Appendix A Exhibit E.

Jurisdiction	Back River – 180 MGD Capacity	Patapsco - 73 MGD Permit Capacity <sup>1</sup>
Anne Arundel County	Not served at Back River.	6.4
Baltimore City	180 MGD	54.1 MGD
Baltimore County	Capacity Baltimore City/County Shared	Capacity Baltimore City/County Shared
Howard County	Not served at Back River.	12.5
TOTAL	180	73

**TABLE 4-5: BACK RIVER AND PATAPSCO SEWERAGE SYSTEM ALLOCATIONS**

<sup>1</sup> Current permitted capacity, allocations established under Patapsco Memorandum of Understanding

## 4.10 WASTEWATER FINANCE

In November 1978, the voters of the City approved the Charter Amendment establishing the Wastewater Utility as a separate enterprise and requiring that the Wastewater Utility be financially self-sustaining and operated without profit or loss to the other funds or programs of the City. In addition, the Charter Amendment requires the City to approve a separate budget for the Wastewater Utility.

As required by the Charter Amendment, the City Council adopted Ordinance 941 in December 1978 establishing, among other things, a mechanism for the determination of rates and charges. Ordinance 941 requires that the Board of Estimates, upon the recommendation of the Director of Finance and the Director of Public Works, establish rates and charges sufficient to make the Wastewater Utility self-supporting at all times and that it adjust the rates if the projected statement of results for the immediate prior year resulted in a loss or deficit. In addition, Ordinance 941 requires that the rates so established shall be at a level sufficient to recover any accumulated deficit from prior years.

The City Board of Estimates establishes wastewater rates and charges for customers within Baltimore City. The City is obligated by statute to provide wastewater treatment and disposal services to Baltimore County at cost. The City's current method of determining the cost to serve Baltimore County is set out in a City-County Sewerage Agreement dated March 6, 1974, which establishes the methods for how the County's share of the Wastewater Utility's is to be determined for establishing costs. Among the costs to be apportioned are the costs of operation, maintenance and administration, major repairs and capital projects during construction. Portions of Anne Arundel and Howard Counties as well as BWI Airport discharge wastewater into the system through Baltimore County; Baltimore County recovers the costs attributable to the treatment of such wastewater from those entities. An agreement exists with Anne Arundel County to determine cost with respect to a portion of that County's wastewater which is discharged directly into the City system.





The revenues of the Wastewater Utility are primarily derived from wastewater service charges, with a minor amount of revenues generated by charges for other services and interest earnings on investments. Wastewater service is billed to customers in Baltimore City on the basis of a minimum quarterly charge and flow charges per one hundred cubic feet of metered water consumption. Customers with higher-than-normal concentrations of pollutants in their wastewater are assessed a surcharge designed to recover the costs of treating such higher-strength wastes.

DRAFT